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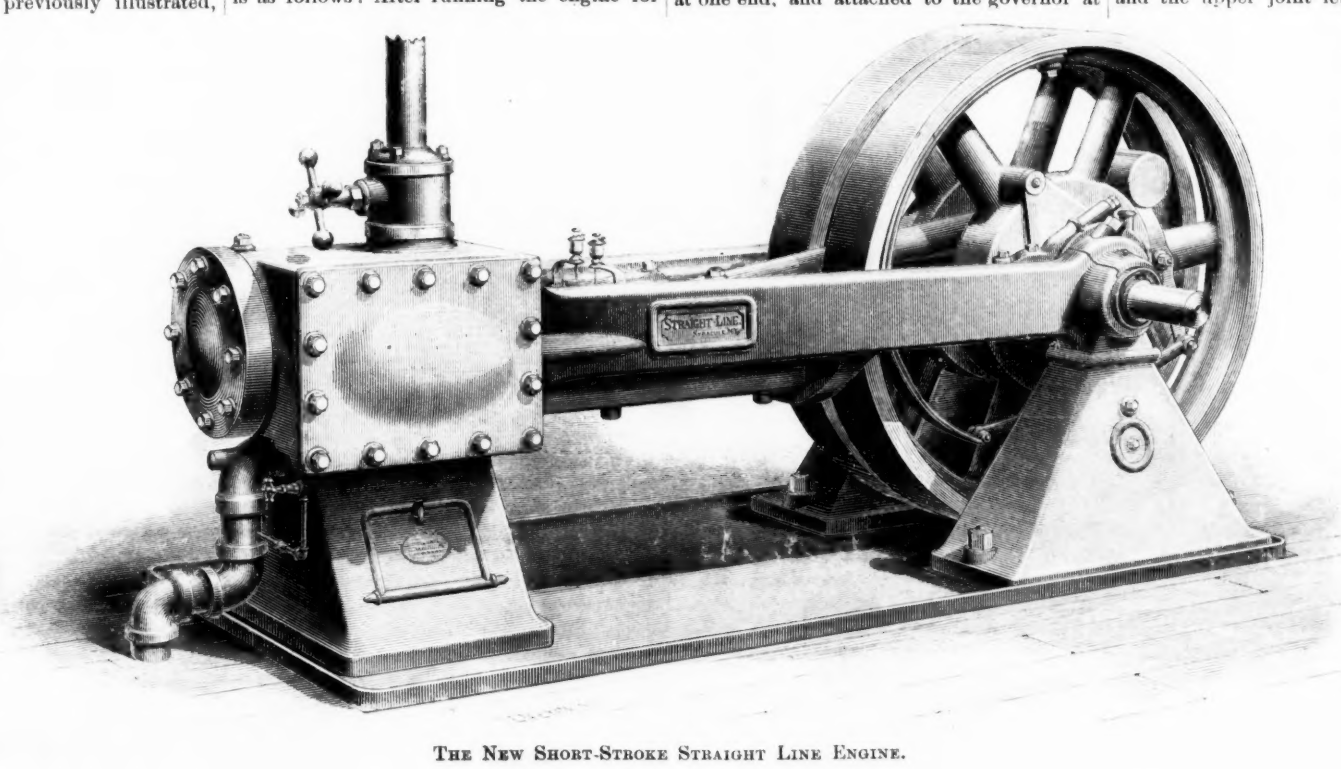
The New Short-Stroke Straight-Line Engine.

We present with this a view of a new engine recently brought out by the Straight-Line Engine Company, of Syracuse, N. Y., which, though closely resembling the engine they have been building for the last six years, and which, we have previously illustrated, differs so much in detail that we feel justified in presenting this illustration together with some of the details.



THE NEW SHORT-STROKE STRAIGHT LINE ENGINE.

The leading characteristics of the original engine, that is, the two arms forming the frame, cast with and run in straight lines from the cylinder to the two main bearings, and resting upon three self-adjusting supports, with the fly-wheel in two parts between the arms of the frame and forming the "throws" of the crank, are all maintained.

By the arrangement of having the fly-wheels, one of which carries the governor and the eccentric inside the frame, the center of the valve is brought in line with the center of the eccentric, and the valve mechanism is in a direct straight line.

We published some of the details of this engine last year, but some changes have been made, and, in order to explain these and other features of the engine to those who may not be familiar with its peculiarities, we give with the new cuts some illustrations on page 2 that have appeared before.

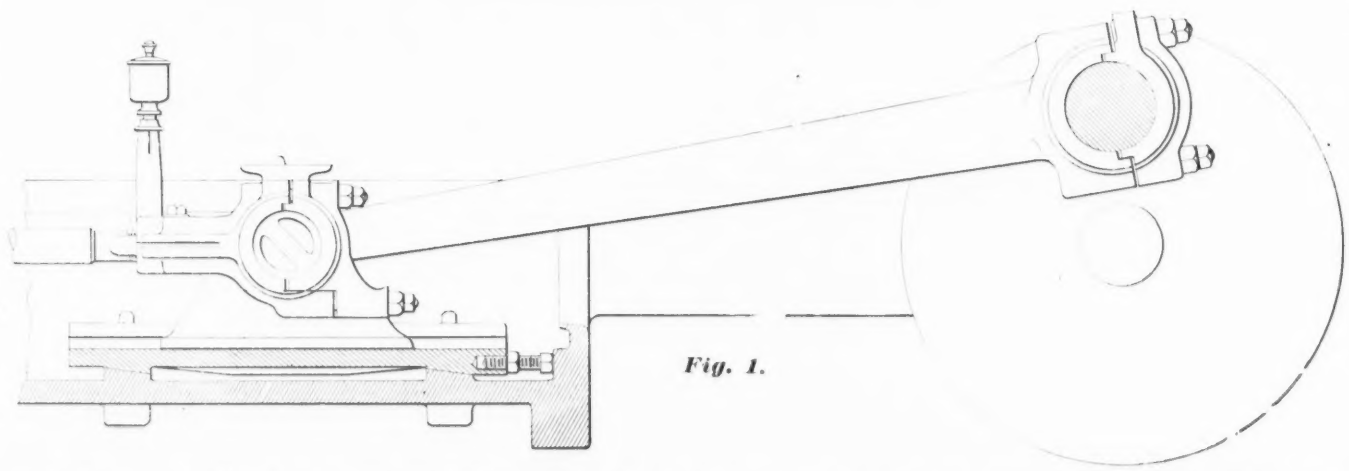


Fig. 1.

In order to simplify the explanation, the mechanism has been separated into three separate sections. Figs. 1 and 2 show such of the details of the parts between the cylinder and crank as are peculiar to this engine. The cross-head is of the slipper guide style, and the illustration, Fig. 1, shows the simple method adopted for adjusting the guide to the proper height to maintain the alignment. Another feature peculiar to the Straight-Line not mentioned above, that of making the cross head pin fast in the connecting rod, is used in this engine also, but in a somewhat different form. As will be seen by Fig. 2 the pin is made much larger, and this allows of its being made of "steel casting" and cast hollow with cross bars at each end for centering. These pins are held in the rod by a binding screw which catches in a groove that is milled around one-fourth of its circumference. After the pin is placed in the rod and the binding bolt inserted, the pin is prevented from working out endwise, and the binding bolt prevents it from turning; but when the binding bolt is slackened the pin can be rotated one-fourth of a revolution. The scheme is as follows: After running the engine for a while, the engineer is instructed to slack the binding bolt, give the pin a quarter turn and bind it fast. By repeating this the pin can be kept more nearly round, probably, than by any other plan. By referring again to Fig. 1, it will be seen that the plan for taking up the wear in the cross-head pin bearings is simply that of setting up the common half box, and the endurance of the arrangement, with the hardened and ground steel pin running in babbitt lined boxes of double the ordinary size and length must be satisfactory. The ingenious method of securing the cross-head to the piston rod, for the suggestion of which the company acknowledge their indebtedness to a former foreman, Mr. A. W. Smith, we have before fully described.

The drop oil cups for lubricating the cross-head pin are located so as to have the drop "picked" off just as the cross-head completes its stroke at the cylinder end, and while it is traveling at its slowest speed. The oil, as it leaves the wearing surfaces of the pin, is conveyed to the lower slide.

Fig. 3 shows the governor, which, as will be noticed, consists of a single governor ball and a single spring and connecting links, which couple them to the eccentric. The eccentric is cast on a plate which is pivoted at one end, and attached to the governor at the other. The weight of the governor ball is such as to balance the eccentric, eccentric strap and the other attachments. The action is the same as that of most of the shifting eccentric kind, except that the pivot upon which the eccentric turns is located so as to give a variable lead, and the pivots throughout are frictionless, as shown in Fig. 4, and by scale beam joints permitting of a closer regulation than is the case where the power of the governor is called upon to overcome the friction of journals under high pressure. It will be noticed that the elements composing the governor and the working joints are reduced to about the smallest number possible. None of the joints need oiling, except the pivot upon which the eccentric plate swings, and the movement of this is very slight.

The main shaft boxes are shown in detail in Fig. 5., a description of which we have previously given. The builders claim that this is one of a number of the features of their engine that will not be changed.

Figs. 6 and 7 show the parts that connect the eccentric with the valve. The method of connecting the rod to the eccentric strap is convenient. The lower joint in the eccentric strap is set up tight, metal to metal, and the upper joint left open $\frac{1}{8}$ of an inch. The adjustment is done wholly by the check nuts on the upper bolt, the elasticity of the strap being quite sufficient to compensate for wear. The slide between the eccentric rod and valve rod is a complete miniature cross head — with wearing surfaces at top and bottom longer than the greatest travel of valve. An oil hole through the center of the bolt that holds the upper slide, conveys oil to all the wearing surfaces. The movable name plate in the front of the engine gives free access to all parts of the valve rod slides and to the stuffing-box on valve rod.

The throttle used is one designed by John Coffin, and is the same as used on all engines built by this company. It is shown by Figs. 8 and 9. The special features of this throttle, and other features of the engine not here shown, have before been given by us.

The builders of this engine claim in their forthcoming circular, advanced sheets of which we are favored with, that they have reached the limit of their ability in the direction of leaving off things that are unnecessary, and will stop at nothing to make the engine better.

Although the clearance has been reduced to five per cent., the engine runs smoothly at all points of cut off, which ranges from $\frac{3}{4}$ to zero, or so short that it will not run away with full throttle and no load.

Triple Expansion Engines.

At the late meeting of the Institution of Mechanical Engineers (England) Mr. Parker instanced two large steamers exactly alike, one fitted with triple expansion engines and the other with two-cylinder compound. In a voyage to Australia, at the same speed the triple expansion engines required the con-

sumption of 1200 tons less coal than the other. The engines were of 6,000 indicated horse-power. Unfortunately in the interest of a fair comparison the steam pressure with the triple expansion engines was 145 lbs., and with the two-cylinder compound but 90 lbs. Mr. Parker said that with triple expansion engines steamers were now working with 30 per cent. better economy than was the case five years ago.

Professor Kennedy called attention to the fact that in comparisons between two-cylinder compounds and triple expansion engines, what had so far really been proved was that the use of high pressure steam was more economical than the use of low pressure steam.

Moderation, Conciliation and Arbitration.

P. M. Arthur, grand chief engineer of the Brotherhood of Locomotive Engineers, in his annual address to the convention recently held in New York City, said:

"Pursuant to the laws of our brotherhood, we have been called upon by the members to help adjust grievances on ten different roads, and are proud to say a satisfactory adjustment was effected in each case. While we did not obtain all the men desired, in every instance, we did, however, succeed in securing an increase of wages, and established rules for their future protection. We do not believe in asking for more than a fair and just compensation, commensurate with the services rendered. In all our dealings with the railway companies and the men, we have endeavored to be governed by the golden rule, which is the rule of our brotherhood, 'Do unto others as ye would that others should do unto you.' We concede to every man the same rights and privileges we claim for ourselves.

"The labor agitation which has prevailed throughout the country during the past twelve months will, we believe, work out good instead of evil in the end. There is a growing feeling among workingmen and capitalists that moderatian, conciliation and arbitration must be had. The good sense of American workmen and the fairness, on the whole, of employers, will not long admit of differences hurtful alike to the interests of both. The two interests will come together and adjust themselves to the plain necessities of the situation. The great business communities and industrial centers cannot tolerate coercion on either side. Capital cannot afford to be overbearing, and labor cannot turn from peaceful channels without injury. What is needed, and what the times require, is full and fair consideration for both sides. This can be obtained through arbitration. Great wars have been averted by its agency. National instincts throughout the world favor its exercise more and more in settling difficulties between one nationality and another. So potent an agency cannot be overlooked in adjusting the labor problems now commanding wide interest and attention throughout civilized lands.

"It commends itself to the good feeling which underlies the conduct of fair-minded men who may honestly differ. Neither the capitalist nor the laborer is wholly wrong. There is right on both sides. No one will justify oppressions complained of by candid and industrious workingmen. The simple statement of their case will command public sympathy and approval. On the other hand, the public at large will promptly condemn the willful destruction of property and the interruption of business. It is also prompt to disapprove of interference with private rights. There is room enough for everyone in a country like this, and every man disposed to work must be allowed to find the chance. The workingman of to-day may be the capitalist five or ten years from now. He is interested in the considerate and friendly adjustment of all industrial questions. Capitalists and corporations are equally interested in the settlement to be hoped for. There can be no long antagonism. While the great problems touching capital and labor are under consideration, forbearance must be practiced, and a willingness must be shown by the employers of labor and by workingmen themselves to settle all existing troubles in a frank and manly way. Labor must have its just rights and a fair return for its service. The whole country will insist on achieving this result. Also it will insist on the proper remuneration of capital. The sense of fairness among the people will see that all sides are dealt with equitably and justly. Moderation and arbitration are the two great instrumentalities to be used. Capital and labor are ripe for the adjustment."

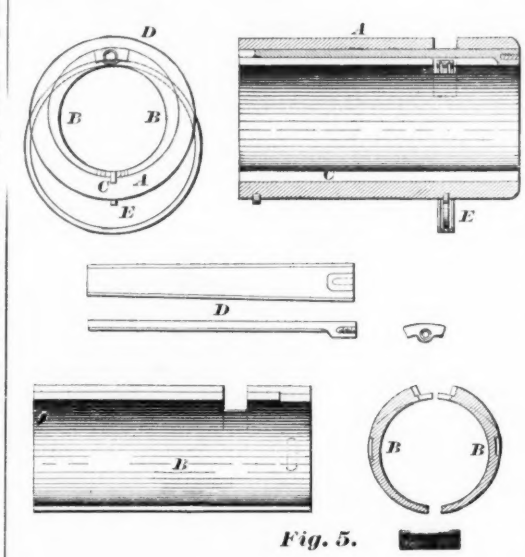


Fig. 5.

car is 8 feet in length, 7½ feet in width, and stands 8½ feet high from rails. The boiler and engines were specially designed for this purpose. The bed-plate is a solid casting, each frame of the pair of vertical engine being bolted to it. The engines are geared to shaft. The water tank, 60 gallons capacity, is under the car. The boiler (vertical) is placed in the center of the car, with the engines in the rear and coal bunker between engines and boiler. Altogether it is a compact and very creditable job. The engines, rated at four horse power, are fitted with link motion, and means for taking up wear. The total weight of car, with coal and water, is 1500 pounds. On the "trial trip" two miles up grade was made in four and one-half minutes.

Steel Gun Forgings.

Brigadier-General S. V. Benet, Chief of Ordnance U. S. A., in his annual report to the Secretary of War, states that the status of the steel works of this country which have thus far undertaken to make steel gun forgings is to-day about as follows:

There is one establishment able, with present facilities, to produce all the forgings, and of the required qualities, for a steel gun of eight inches caliber and hoops of all sizes except the very largest and heaviest, and the breech mechanism and smaller forgings for all calibers. There are two establishments now able to produce the tubes and jackets and miscellaneous forgings for guns of small caliber and hoops of a very considerable size.

This represents the best that can be done to-day by the steel works of this country, and in some respects their experience is yet so new and the extent of their plant and facilities so limited that a great deal of time is requisite for the production of the forgings. The orders from the department have also been very limited, but with the prospect of a larger demand there is but little doubt that the works with which the department has had dealings will respond with all needed alacrity in providing the necessary facilities for promptly executing its work. It is thought that these manufacturers could commence delivering the heavier forgings, say for a 10-inch rifle, from eighteen months to two years after date of contract, but the production of such forgings would for several years be slow, as the manufacturers wish to feel sure

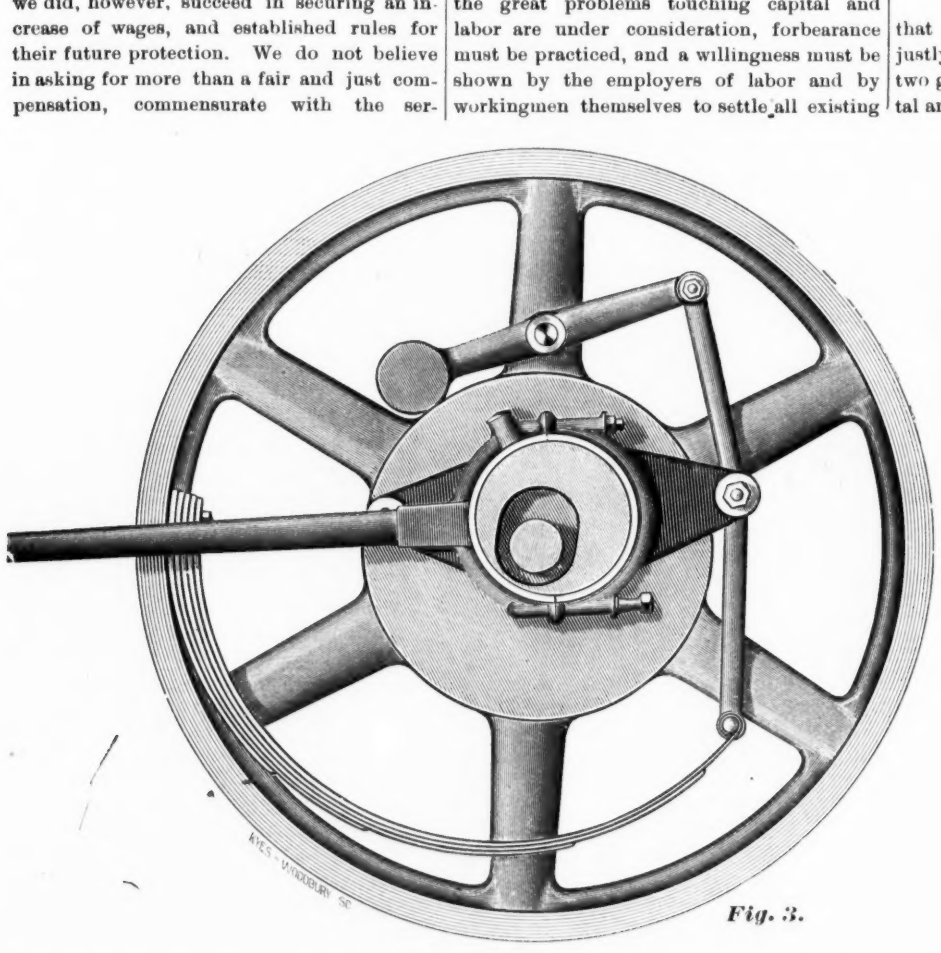


Fig. 3.

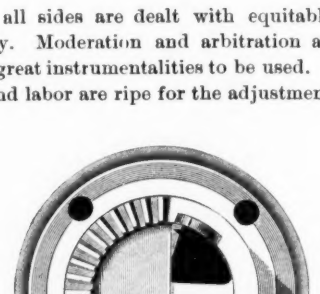


Fig. 8.

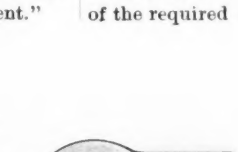


Fig. 4.

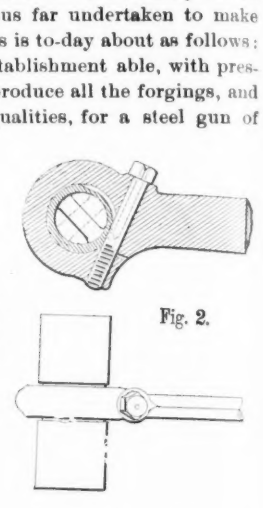


Fig. 2.

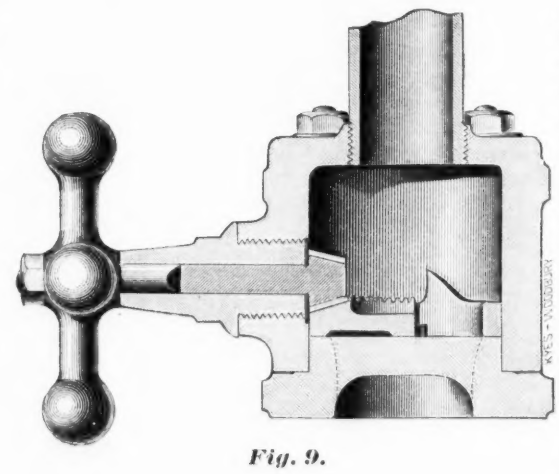


Fig. 9.

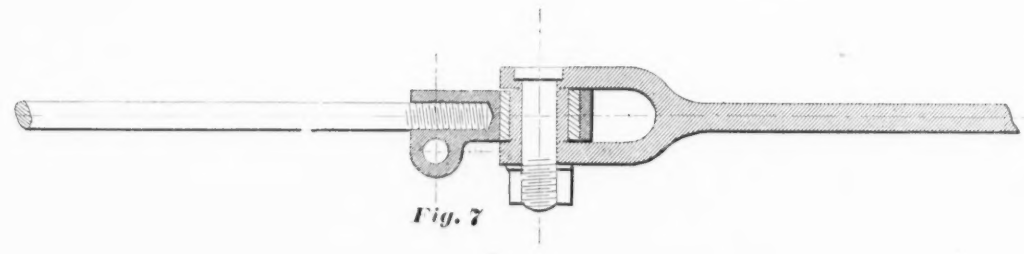


Fig. 7

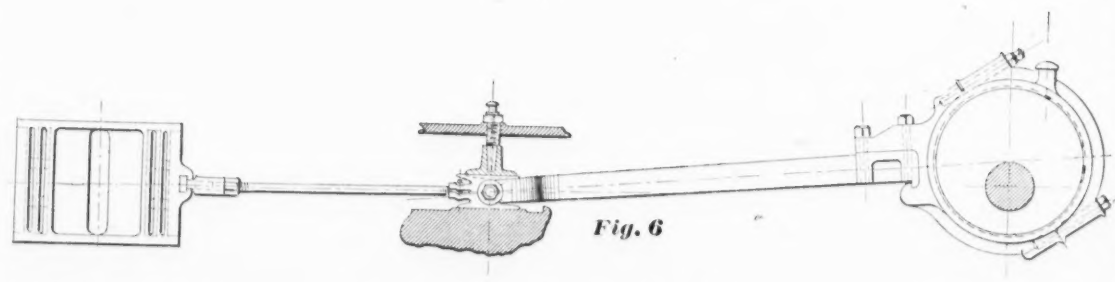


Fig. 6

An Observation Car.

Geo. W. Morse & Co., Rutland, Vt., have recently constructed an observation car for roadmaster and track superintendent's use on the Bennington and Rutland Railroad. The

of their ground before assuming the risk of a number of possible rejections. The production of the tube and jacket forgings for 12-inch guns could be accomplished in from two and a half to three years. Then the time for finishing and assembling the parts—that is, the manufacture of the guns—must be added in making any estimate on the procurement of armament.

Practical Drawing.

BY J. G. A. MEYER.

EIGHTH PAPER.

94. When a drawing of an object is to be made, whose height greatly exceeds its breadth, for instance a factory chimney, or a church steeple, it is customary to assume the edge *a b* of the board, Fig. 64, to be the bottom edge. But cases of this kind are comparatively few, and consequently the edge *b c* of the board in Fig. 65 is generally assumed to be the bottom edge. In fact, throughout this work we shall always consider, unless otherwise stated, the edge *b c* in Fig. 65 to be the bottom edge. Now all lines drawn parallel to the bottom edge of the board must always be considered to represent horizontal lines; and all lines drawn parallel to the left-hand edge *a b*, vertical lines.

All lines not parallel to these edges will be considered to represent some oblique lines.

Again horizontal and vertical lines are perpendicular to each other, and therefore the edges *a b* and *b c*, Fig. 65, must also be perpendicular to each other, or in other words, these edges must be square with each other. In cases in which the edge *a b*, as in Fig. 64, is considered to be the bottom edge, then the edge *a b* must be square with the edge *a d*.

For the sake of neatness all the edges of the board should be square with each other, as stated in Art. 72. But in all cases the bottom edge must be square with the left-hand edge of the drawing board, because the head of the *T* square is always placed against the left-hand edge of the board when horizontal lines are to be drawn; and when it becomes necessary to use the *T* square for drawing vertical lines, its head must always be placed against the bottom edge of the drawing board; and therefore it is absolutely necessary to make these two edges of the board square with each other, but it is not absolutely necessary that the other two edges should be square. We would caution the student to use the bottom and left-hand edges of the board only, and not get in the habit of using the other edges.

95. We must also give attention to the surface of the drawing board to which the paper is fastened. This surface must be perfectly flat; or, geometrically speaking, it must be a plane surface (Art. 26).

If the surface is concave, that is, hollow in the center, and the paper stretched tightly over it, the needle point of the compasses is liable to slip through the paper over the hollow place of the board, and thus create large holes in the paper, when in the act of describing a circle. Again, if the surface of the drawing board is convex, that is, high in the center, and the paper stretched over it, the high places will retain all the dust, making it very difficult to keep the paper clean over these high places; in fact, it generally ruins the drawing.

96. The blade of the T square should always be square with its head; otherwise lines drawn with it will not be parallel to the edges of the board. The student must never use the edge of the T square to guide the knife when a sheet of paper is to be cut, as this will certainly ruin the T square. Always use an ordinary straight edge for this purpose.

97. All the tools having been put in good order, they must be kept so; never lay the tools away, particularly the drawing pens, unless they are clean and in good order.

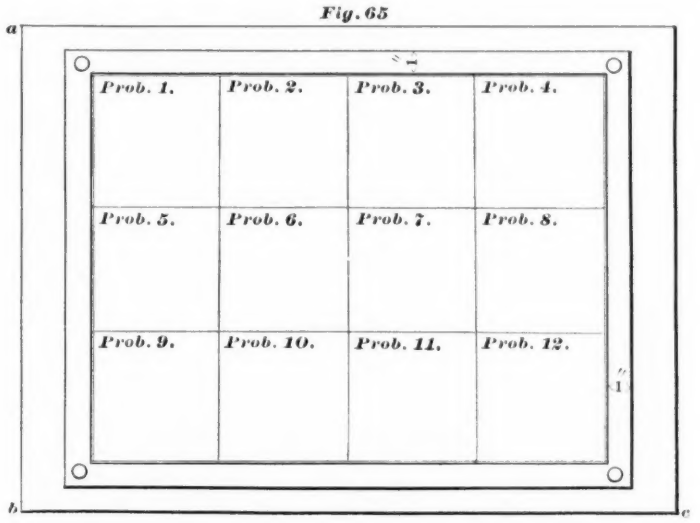
98. To attain neatness when several problems are to be drawn on one sheet, the position of these problems should be systematically arranged. We would therefore advise to draw first border lines, say, one inch from the edge of the paper. Then divide the space between the two short border lines into four equal parts, by drawing parallel lines across the paper (see Fig. 65). The space between the long border lines divide into three equal parts, by drawing parallel lines lengthwise of the paper. This will create twelve equal spaces, and into each of these we put one of the following problems, commencing with the top left-hand space.

99. Since the student is supposed to know nothing or very little of geometry the following remarks are deemed necessary.

Let it be required to describe a circle five inches in diameter, of which the given point *A* is to be the center.

To explain in ordinary language how to do this, we would say: open the compasses so that the distance between the needle point and pencil point is equal to two and one-half

Fig. 65



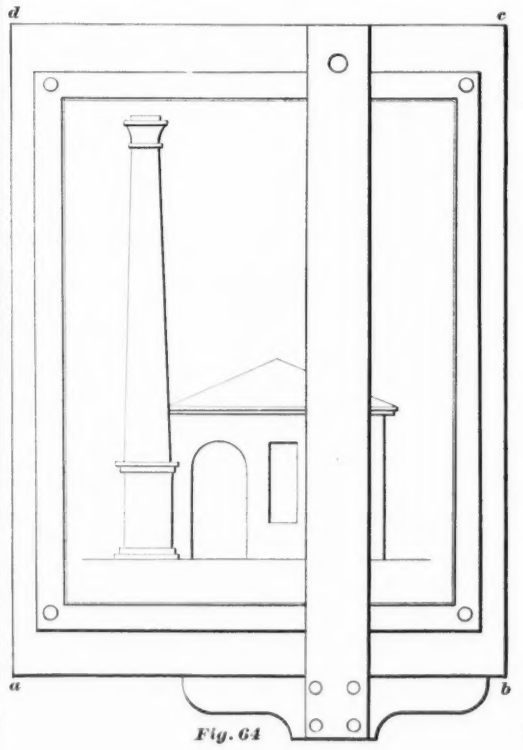


Fig. 64

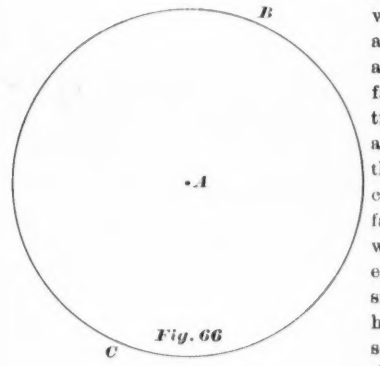


Fig. 66

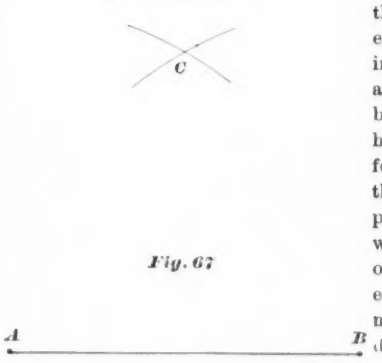


Fig. 67

inches, then place the needle point on the given point *A*, Fig. 66, and describe the circle *B C*. Now this explanation is all very well, but it contains too many words. If we remember that the distance between the pencil point and needle point of the compasses is equal to the radius of the circle (Art. 30) we can readily understand the foregoing explanation written in a geometrical language, namely. From the given point *A* as a center, and with a radius equal to two and one-half inches, describe the circle *B C*

100. Again, let *A B*, Fig. 67, be a given straight line four inches long, and let it be required to find a point *C*, so that the distance between the points *A* and *C* is equal to four inches, and the distance between *B* and *C* also four inches.

Instead of saying, "open the compasses so that the distance between the needle point and the pencil point is equal to four inches, etc." it will be better to explain the construction in the following manner:

From the point *A* as a center and with a radius equal to the length of the line *A B* describe an arc; also from the point *B* as a center and with the same radius as before, describe an arc; the point of intersection of these two arcs will be the required point *C*.

Once more, instead of saying, "divide a given straight line into two equal parts," we shall simply say, bisect a given straight line.

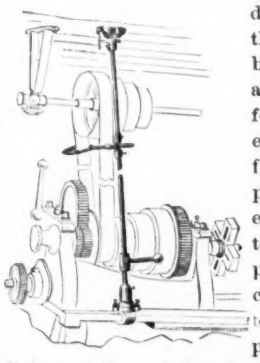
101. Fig. 65 represents, on a small scale, the sheet of paper fastened to the drawing board, and divided into spaces as recommended in article 98. Similar spaces thus formed on the student's sheet should be marked problem 1, problem 2, as shown in figure, thus clearly indicating the space allotted for each problem.

The size of sheet shown in this figure is 24 inches long and 19 inches wide, as recommended in article 74. The distance of the border lines from the edges of the sheet is arbitrary, and may be made to suit the student's taste. In this figure we have adopted one inch for the distance between the border lines and edge of sheet. The border lines, horizontal, and vertical lines dividing the sheet into equal spaces should be correctly drawn with the aid of the T square. In using the T square follow the directions given in article 79. The reason why we direct the student to draw the vertical lines with the T square, and not with the set square as instructed in article 81, is that the set square is shorter than the lines which are to be drawn.

102. In order to form the habit of using these squares and drawing tools correctly we insist that the student shall begin right here in the commencement of these studies to use all the tools in a manner as previously instructed; even in drawing border lines or the division lines the aim should always be to attain accuracy and neatness. The student will derive the greatest benefit from the construction of the following problems: By drawing all the straight lines entering into the construction of these problems with the aid of a small wooden straight-edge, because by so doing he will learn how to construct these problems on the floor, on which T squares and set square cannot be used, which may often occur when work has to be laid out full size on the shop floor.

Cone Pulley Belt Shifter.

This device is designed to facilitate the shifting of belts on cone pulleys; something which it accomplishes very satisfactorily, doing away with the necessity for belt sticks, which are never to be found when wanted. Clamps of different forms are provided, which enable the device to be readily applied under any conditions likely to exist. When properly put up a slight motion of the hand is all that is required to shift the belt from one step to another. It is applicable to cone pulleys, for whatever purpose used. The manufacturers are Post & Co., Cincinnati, Ohio.



Torpedo Experiments.

Although the Whitehead torpedo has formed part of our naval equipment for some years, yet never until recently was one exploded fully charged in close contact with the hull of an ironclad. The "Resolute," the *corpus vile* of the torpedo experiments which have been going on for some weeks past, was moored fore and aft in Farcham Creek, Portsmouth, and a 16-inch Whitehead, charged with 93 pounds of gun-cotton, was lashed to a boom and laid in contact with the port side, amidships. It was about 8 feet under the surface and close to the bilge keel. The conditions were entirely in favor of the torpedo, and it was expected that the destruction of the vessel would be both sudden and complete. The result, however, fell very far short of the anticipation. The ship was slightly inclined by the force of the explosion, and then listed a little in the opposite direction. Beyond this and the upheaval of the water there was nothing to be seen by the spectators. Investigation showed that the bilge keel had been shaken off to the extent of 20 feet, and the plating below much indented. Between the bilge keel and the armor-belt the skin plating was forced in between the frames, and three or four strakes had parted in the middle for a length of 8 feet; some of the butts had been opened so that gashes 2 inches or 3 inches wide appeared at the junction. Internally skylights were broken and the coal blown about, but only one compartment was penetrated. The exact amount of damage cannot yet be determined, but it is evident that the ship was not disabled and could fight her guns perfectly well.—*Industries.*

Just before election there were 1,350 men employed in the various departments at the Brooklyn Navy Yard. According to the New York *Sun* this was the largest number in several years. A few days after election two hundred were discharged, and work is so slack that more will probably have to go.

E. G. Ferber read a paper recently before the Liverpool Engineering Society on Wasting in Marine Boilers. He asserted that steel, now very generally coming in use, was much more liable to corrosion than iron, and made the very reasonable point that the anti-corrosive properties of material, as well as its strength, should be taken into consideration. He referred slightingly to appliances and fluids for preventing corrosion, but instanced the success in several instances of the Bower-Barff treatment, which had proved successful, but thought nothing now known would prevent decay of some of the parts of marine boilers.

Foundation for Power Hammer.

The engraving representing hammer foundation represents that recommended by Beaudry & Cunningham, Boston, Mass., for their upright cushioned power hammer.

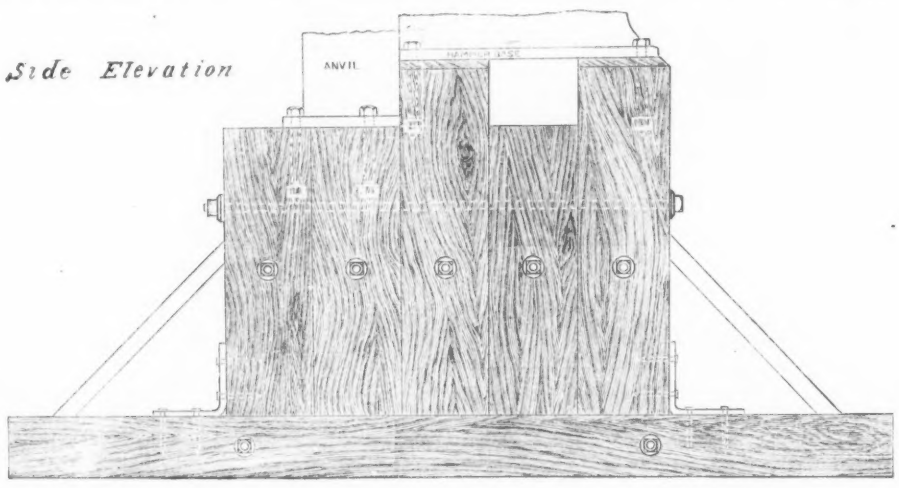
For timbers they recommend red oak, but say Southern pine, or various kinds of hard wood will answer. The foundation for the anvil seat consists of four timbers set on end and bolted together; these timbers are also bolted to the hammer bed foundation.

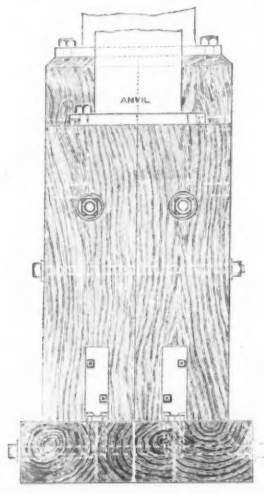
The foundation for the hammer bed consists of timbers bolted together and set on end. This arrangement—making the anvil hammer foundation separate—prevents the concussion of the blow from seriously disturbing the hammer foundation.

The anvil and hammer foundations rest on a platform of timbers, the timbers extending well to front and rear, but not necessarily much to the sides. They say:

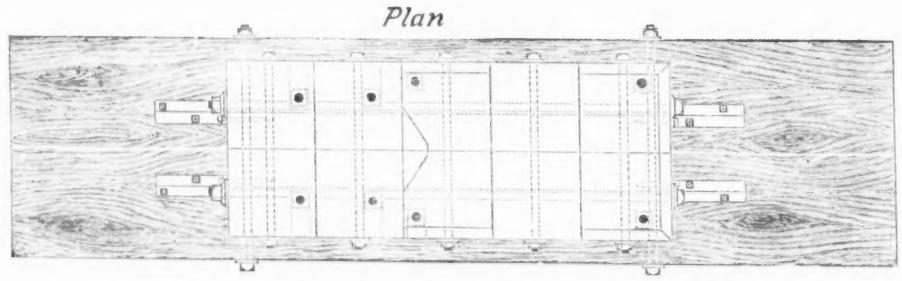
"As the full force of the blow is received by the anvil foundation, it is often desirable—and in some locations necessary—to place under the lowest timbers of the anvil seat a sub foundation of stone, laid on a bed of cement. This is made by first laying about six inches of cement and gravel, well mixed together, and properly leveled, upon which the stone is then placed, bringing the whole up to the level of the gravel bed, under the hammer itself. On this rests the long timber platform which supports the regular timber foundations of both anvil and hammer.

"After all the timbers for the foundation are ready, they should be placed together, to see if they fit properly, and the holes made for the bolts, which should be placed as seen in the cut—from side to side and from end to end. The foundation should be braced to the horizontal timbers at the base, by iron knees, placed in front and at the rear; and it may be strengthened further by heavy braces of timber, placed also in front and rear.





End Elevation.



Foundation Plan for BEAUDRY & CUNNINGHAM'S UPRIGHT POWER CUSHIONED HAMMER.

"The first thing to be considered is the location, which should be so placed that, when the hammer shall have been put in position upon it, the center of the drive-pulley on the hammer shall be directly under the counter-shaft above, so that the counter-shaft and drive-pulley shall turn toward the front of the hammer, bringing the slack side of the belt next to the idler pulley on the hammer.

"All about the foundation should be well packed with gravel, earth, or cinder, which should be wet down as it is put in and well tamped.

"As the hammer can be set at any height, to suit the operator's convenience—before placing the foundation determine the height you require the face of the anvil die to be above the floor of your shop, and the foundation should be placed above or below the floor accordingly. At the same time, be sure that the treadle of the hammer works clear of the foundation, and that the floor allows it to drop sufficiently low; otherwise, the hammer will not be completely under control. If necessary the angle at which the treadle is bent may be changed.

"Care should be taken that the anvil is fitted closely to the hammer frame, and that the anvil bolt is screwed up hard before marking the places for fastening down bolts."

Experiments on an extensive scale are being made in France in casting chains of steel, in solid links.

Reducing Friction.

The correspondent, who wrote recently over the signature C. O. Sine, outlines a possible improvement in the indicator, by giving the piston rotary motion along with vertical motion. It is beyond question that if this could be practically accomplished, the friction would be greatly reduced. An illustration exactly to the point is given in *The Engineer*, which we copy:

An account of a remarkable system of making copper tubes, illustrated by specimens of the work done, was given at the recent meeting of the British Association, by Mr. James Robertson, of Glasgow, in a paper read by Mr. Ralph Heaton, of Birmingham, in whose works the system is adopted. Mr. Robertson calls the principle involved in his system the "cross surface motion frictional contact of solid bodies." We need not reproduce Mr. Robertson's paper, as, having seen the machinery at work in carrying out the process, we may, perhaps, describe more briefly what is meant by the above, and then leave our readers to employ their own nomenclature. The essential feature is the application to tube-drawing mandrels of the compound motion which anyone gives to a cork when it is pulled out by a slightly twisting movement, or of the partial rotative movement given to, say, a wheel, when it is being pushed on to a shaft upon which it fits tightly. The same principle had previously been employed by Mr. Robertson as a means of making pistons and piston and slide rods move more freely than when the pull or push imparted to them caused them to move only in the direction of their axes, and not to rotate upon them. The same principle has recently been employed by Mr. Wicksteed for the rotating pistons in his autographic testing apparatus. The difference between the force necessary to slide a gland along a rod when the rod is fixed, and when it is rotated at a hundred or so revolutions per minute, has been found by Mr. Robertson to be something like sixty times, and the force necessary to pull a bulb-ended mandrel through a tube is said to be from sixty to eighty times more when pulled in the ordinary way than when rotated at the same time that it is pulled. According to Mr. Robertson, the greatest saving of power seems to be effected when the movement in a rotative sense of the surface concerned is about equal to its linear axial advance. The rotating mandrel has been adopted for drawing welded tubes, and it is found that by rotation the mandrel is at the same time prevented from heating to any material extent, and that a tube which previously required two heats can now be made in one. This causes a saving in mandrels, and we are informed that the higher the speed the less the heating of the mandrel for given work, and a mandrel of proper form if rotated at about 4,500 turns per minute may be forced through a white hot billet of steel 1 foot in thickness so rapidly that the mandrel may be held in the hand when withdrawn.

The application of the invention of Mr. Robertson has been developed in the works of Messrs. Heaton, of the Mint, Birmingham, where cast copper ingots are made direct into thick "shells" for large or small tubes. The ingots are from 4 inches to 7 inches diameter, and by means of a small mandrel a hole may be, and often has been, forced into one of these smaller sizes; but by making a small hole through in the first instance in a special machine, the mandrel enlarging the hole from, say 1 inch to 3.5 inches, may be pushed through the ingot at the rate of from 6 inches to 9 inches per minute, and even a foot per minute, a current of oil being maintained through the hole and the mandrel rotated at about twenty revolutions per minute and pushed with a pressure of about fifty tons.

Education in Handicraft.

Engineering in a prominent article under the above heading makes a comparison of past and present engineers unfavorable to the latter. It says:

Twenty years ago it would have been considered absurd that any one should aspire to become a mechanical engineer without being a proficient in handicraft. All the great engineers of the past, and many of the then present generation, were first-rate mechanics, and were quite able to take a job out of the hands of any man in their shops and do it as well, if not better, than he. They had begun practical work at an early age, and the energy which had raised them to the front rank in their manhood had, while they were boys, urged them to excel their shopmates, and to attack every difficulty and become masters of every operation within the range of the establishment at which their apprenticeship was passed. They could mould, forge, fit, and turn, and when they became employers on labor they not only knew how work ought to be done, but also knew how to do it. But since the time we speak of a great change has taken place in the conditions of handicraft. The old-fashioned mechanic who could turn his hand to everything, and not only execute the work, but design the greater part of the details, is growing extinct. Division of labor has killed him. * * *

He [the engineer] is no longer expected to spend years in the shop; instead of that he attends classes where he is lectured to by learned professors, and in a month he receives, and perhaps assimilates, the information which took his predecessors years to gather up for themselves. His time is so occupied in the acquisition of book knowledge, to use a colloquial term, that he has but little opportunity for work in the shops, and even that little is turned to poor account, for modern machine work has taken all the zest out of handicraft pursuits. The parts of a machine now go together like the pieces of a Chinese puzzle, while the distinguishing marks they bear destroy the pleasure of finding out their proper relationship. It is consequently no infrequent thing to find a modern mechanical engineer destitute of manipulative skill.

Such a state of things is essentially unsatisfactory. Every engineer engaged in the design and manufacture of machinery should be a mechanic. Not only is this necessary to give him a firm grip of his business, and the respect and control of his men, but also for the sake of the mental training it supplies, and the corrective it affords to the priggishness acquired in the class room.

Machine Tools for Patternmakers.

By F. W. Barrows.

The lathe is another very essential tool in pattern work—in fact, patternmakers could hardly keep house without one at least in the shop, and there should be two in order to do the great variety of work which comes to nearly all shops. We must have a lathe large enough to swing the big pieces, and as this big lathe cannot be run at a high speed without a great waste of power and excessive wear, it will be good economy to put in a small lathe for the small work.

The number and size of lathes necessary for any particular shop will be governed by the size and kind of work to be done. Some shops can get along with one lathe, or, perhaps, with only the occasional use of a lathe, while some other shops, as, for instance, a shop where steam and water fittings are made for plumbers, need a lathe for every man, and a good lathe, though they needn't be very large.

There are plenty of lathes running every day now that ought to have been out on the scrap heap ten or fifteen years ago. The pattern shop is a kind of hospital or home for all the worn-out lathes in the works.

I have seen an old, worn-out engine lathe, one that had probably never run over 1,200 to 1,500 revolutions, brought into the pattern shop with the back gear and feed attachment removed, and expected to get right up to 4,000 turns a minute without any trouble. This is, unfortunately for us poor pattern-makers, not often realized.

I have tried to make patterns on a lathe where the face-plate slipped over the end of lathe and fastened with a set screw, and as the end of spindle was at least $\frac{1}{32}$" smaller than the hole through face-plate, any job you happened to be turning had to be finished without taking it out of the lathe, and I guess every man in the shop got his knuckles rapped by the set screw. It seemed to me sometimes as though it was all set screw, and every time you touched the work it would revolve on a new center. Another lathe in the same shop had wooden shears, but it was a good running lathe, as the head was fitted up nicely, and had a wooden cone. We usually have the luck to get lathes in the pattern shop with iron cones, and with the large end of cone towards the front end of spindle. This is because they have been engine lathes or brass-finishers' lathes, and the iron cone wrong end foremost was all right for the purpose the lathe was intended for. But this lathe had a wooden cone with the right end—that is the small end—towards the front end of spindle. The only trouble with this lathe was speed. It ran too fast. On the fastest speed you could hear it hum, and it probably made 6,000 turns a minute. This was too much for a lathe that would turn 28" in diameter over bed, and was also made extra heavy for face-plate work for which the back end of spindle was threaded.

I can also remember another lathe with wooden shears, about the same size but not so good a lathe, and at the time I used it it was badly worn. You could hear the spindle rattle all over the shop when it was running. The face-plates on this lathe were all right, but the hole in spindle for the spur-center was not central. Therefore, if a job was removed from the lathe and the spur-center

taken out for any reason, it was almost impossible to get the work back in the lathe so that it would run true.

The tail-center was never in line with the spindle, but this isn't absolutely essential for a turning lathe where all the work is done with hand tools; still the lathe would work better if the two were kept in line.

These are a few specimens of the lathes generally found in pattern shops, and are a fair sample of the general quality of these tools. There are some shops, and it is a pity there are not more, where you may find good tools, which were made for the purpose they are serving.

Here, again, is another trouble: There are a great many patternmakers, as there are men in all other trades, whose chief and seemingly only object in life is to pass away the time between two consecutive pay-days in the easiest possible manner. Such men as these always use a lathe without looking to see if it wants oiling. In fact, the only time they ever oil a machine is when the need of it is brought to their notice by the spindle getting hot, and perhaps stopping. There is probably no class of machinery so easily injured by neglect in this particular as high-speed wood working machinery; consequently, one of these men can do a great deal of harm in a very short time. I call to mind a recent case of this kind, where a lathe was used without oiling, got hot and stopped; then the man using it, in order to make it run so that he could finish his job, oiled it, and, finding that didn't entirely cure it, he loosened the set screw at tail end of spindle, and also loosened the cap screws in both boxes. The lathe never got over it for three months, and I don't know as it has fully recovered yet.

There was a time when it was not considered necessary—perhaps it was also thought to be impossible, or at least impracticable—to turn wood by means of any tool but a hand tool. A wood-turning lathe, fitted with a slide rest, would have been looked upon as a great curiosity not many years ago. Now lathes fitted up in this way are getting quite common.

There was a time when iron was turned altogether by hand. Now the machinist has the slide rest with automatic feed in any direction, and the patternmaker also has the slide rest, but without the automatic feed. The speed at which it is necessary to run in turning wood, in order to cut it smoothly, makes it difficult to use an automatic feed, as, for instance, in cutting a screw. I have seen this done on soft, dry pine in an engine lathe, but it wasn't a job to be proud of, and had to be all dressed over by hand before it was anywhere near smooth enough to mould. Hard wood works better. Rolls having a spiral groove turned on their surfaces are made successfully from any close-grained, hard wood. Such rolls are often used for winding the cable on elevators. I think, as a rule, that the automatic feed would be a hindrance rather than a help in wood turning. It is, of course, used on lathes which are especially adapted to some one thing, as making broom handles; but this is entirely different from the turning done in pattern work. The speed at which the feed would have to run, in order to work successfully and economically, is, perhaps, the very reason that it cannot be used with satisfactory results.

The requisites of a good speed lathe are a well-fitted spindle, having a taper hole bored in front end for centers, and a thread cut on the front end for face-plates, leaving a good liberal shoulder for them to bear against. The lathe should have wooden cones on both spindle and countershaft, in order that the lathe may be stopped and started quickly. The smallest end of cone on spindle should be towards the front end. This will give more room when working close to the lathe head, as in turning the backside of a piece on a face plate.

The tail center should be in line with the spindle and have a taper hole the same as in spindle, then all centers and chucks that are fitted in the live spindle may also be used in the tail spindle. If the live spindle has brass boxes, see that they are well supported by the housings. The boxes should not be much longer than thickness of housing, otherwise they are liable to spring and wear unevenly, which will soon make them run hot.

The tail spindle should be moved by a screw, and provided with a clamp for fastening firmly at any point.

The saddle and rest should be made so as to be adjusted and fastened in any position, without the use of a wrench, or any tool except what constitutes a part of the saddle or rest. A great many rests are fastened in position as regards height by a square-headed set screw, and every time any change is made in the position, it is necessary to first find the wrench which fits this screw, and if a monkey wrench is used, it will of course have to be adjusted to fit the screw before using. How much better a set screw fitted with a lever handle works, both as regards the rest and also the operator's temper.

The speed at which a lathe should run depends upon its size and the work to be done. A very good speed for a lathe that will turn 12″ in diameter would be on the fastest speed, 4,500 revolutions, and on the slowest speed from 500 to 800 revolutions. This cannot be considered as an arbitrary rule for all classes of work, as there is a great difference in the work done by the same size lathe in different shops, and it isn't every 12″ lathe that can be coaxed or compelled to run 4,500 turns a minute.

Faster speed than this means an extra fine lathe or a loose spindle and excessive wear. If you are fortunate enough to possess a lathe that can be run at this speed and keep cool, don't let anybody tinker with it on any pretense, for in nineteen cases out of twenty they will do it harm. Even taking out the spindle to clean it is bad. It is better to clean it without removing it from the boxes, and a still better way is to use such oil as won't make any dirt, unless you let it get hot enough to burn the oil. To prevent this, put a piece of raw-hide between set screw and tail end of spindle, keep both boxes well oiled, and don't get the belt too tight.

Never locate the counter directly over the lathe spindle. Put it back so that the belt won't be exactly vertical. This helps the belt a little. Then use a belt as wide as possible, lace the belt with wire or shave down the ends and lap them and glue them. After the glue has set, sew the splice as belts are sewed, which are made without rivets, using a small thin lacing and pounding it down flat after sewing. Make the belt just tight enough to do the work. Then if you find that the belt slips, it is likely that you are trying to make the lathe do a job that properly belongs to the big lathe, or perhaps you are working on the same principle as one of my former shopmates, who, when he had a piece in the lathe that had a good deal to be turned off, would point his gouge at the most prominent point, shut up his eyes and jam in the gouge. If the lathe didn't stop, or nothing broke or gave way, he usually succeeded in jamming off considerable wood, but his method was rather hard on tools and on the lathe.

The centers for driving work may be of many different forms; some of which I have endeavored to show by drawings.

Fig. 71 looks and works very nicely while it is kept in good order, but it is rather difficult to repair if the wings get broken, and it is also one that is expensive to make in the first place. That shown by Fig. 72 costs less and works fully as well as Fig. 71. This one may have a notch filed in one wing to locate its position in the piece to be turned, and ensure its being always put back in the same position in a job that has been taken out of the lathe for any reason.

The one shown by Fig. 73 is the same as 72, except that a space is cut between the center point and the wings, one of which is wider than the other, to locate its position in the piece to be turned.

Fig. 74 shows a form similar to 72, except that the line of wings form tangents to central point instead of radial lines. This form may be marked by filing a notch in one wing, as in 72, or by cutting a space, as in 71 and 73. It is best on all of these four centers to have the wings cut away where they join the center point, as in 71 and 73, in order to sharpen the spurs without spoiling the center point; also to give room to turn up the center when necessary.

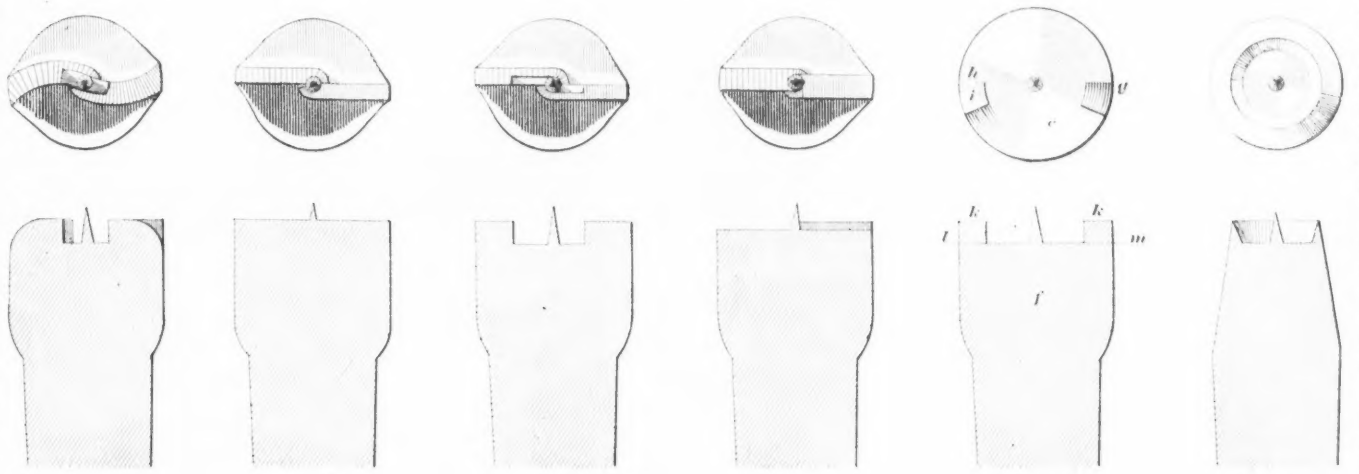


Fig. 71 Fig. 72 Fig. 73 Fig. 74 Fig. 75 Fig. 76

LATHE CENTERS.

Fig. 75 shows two views of another form of spur center, *e* being an end view, where *g h i* show the location of spurs. This is the best form I know of, and its having two spurs on one side and only one on the other, makes it possible to replace any piece of work that has been taken out of the lathe, and to be sure that it will run true. More points may be left if it is thought best, as in making this center it is turned up with a longitudinal section like *f*, then the ring at *k* is cut away, leaving the spurs *a g h i*, and as many more as you wish. This center is intended to be forced into the work up to the line *l m*, then it has no corners to catch the clothing, or rap the fingers. This is another good feature.

The central point on all these different centers should be kept a little longer than the spurs or wings; in order to locate the center in the work accurately, keep this point always turned true at an angle not over 23°, to avoid crowding open the joint on split patterns.

The tail center may be an ordinary 60° center, but this form is likely to crowd open the joint, and for a job that has a long spell in the lathe, it is liable to wear towards one side of a split pattern, as one side is almost invariably softer than the other. A center having a slender point, with a ring around it from $\frac{3}{8}$″ to $\frac{3}{4}$″ in diameter, will prevent both these troubles. It should have a section like the one shown in 76.

I have shown both this dead center 76 and the spur center 75, as being made from a single piece of steel, but an improvement is to put the center point in each as a separate piece, then if Stubbs' steel is used for this point, it may be easily replaced if it gets broken.

I have turned small split patterns of hard-wood without any fastening but the dowels and such as was afforded by centers like 75 and 76. This wouldn't be a good way as a rule, but it shows that the centers are both excellent in their way. A center might be designed for live spindle that would safely hold small light work, and would be a desirable tool.

LETTERS FROM PRACTICAL MEN.

The Avery Rotary Engine.

Editor American Machinist:

I noticed articles in the last two numbers of the AMERICAN MACHINIST in relation to the Avery rotary steam engine. I was employed as a machinist in the Avery shops in Syracuse some three years, commencing in 1837. The shops were then located on the lot where the weighlock now is on the Erie Canal. There were employed at that time some 75 to 100 hands in the different branches of the establishment, building the Avery engine and Avery's Muley saw mills. The Muley saw mill was an invention of Avery's, and was well adapted to go with the rotary engine. There being no saw gate there was nothing to drive but the saw, and the saw could be run from 500 to 600 strokes per minute, and would cut more lumber with less power than the old-fashioned heavy gate mills. These Muley mills went into general use throughout the country, both in steam and water mills, but were finally displaced by the circular saw mills of the present time.

The steam rotary engine was having a great run, being shipped all over the country, and especially South for running cotton gins and other plantation machinery, as it was claimed for them that from their great simplicity they did not require an experienced man to take charge of them, as there were no valves to set or pistons to pack. This claim was finally the ruin of the engine, as the engines were placed in the hands of men ignorant of mechanics and not capable of understanding the loss of power by friction. The shaft upon which the revolving arm was hung had no metal bearings, except at the extreme outer end and beyond the driving pulley; at the end of the shaft opposite the steam pipe, where the steam entered the hollow shaft and thence to the arms, rollers were placed to take the pressure of the steam, usually 150 lbs. Upon the shaft in connection with these rollers was the only metal bearing about the engine. On each side of the case in which the arms revolved was placed a packing box, and at times it was packed with hemp packing. These two packing boxes made the main bearings of the engine. You can see at once how easily an ignorant man could destroy the whole power of the engine by imperfect and over packing, and over tightening with the screw wrench—a power not comprehended by one-half of the workmen in shops to-day.

I have been to examine engines and found them packed so tightly and out of line, that they were not doing one-fourth of the work they should do when in proper order. In one instance I went to a foundry and machine shop where one would have expected to have found the engine in good running order. During the day, while working at the force pump, the man in charge claimed the engine was in good running order. In the afternoon they were to take off a heat in the foundry. After coupling on the bellows the engineer de-

tached all the other machinery in the works. I asked him the reason of casting off the machinery of the shops. He replied the engine was not capable of running the machinery and bellows at the same time with 150 lbs. pressure of steam. It was too late then to overhaul the packing of the engine around the shaft, and by hard firing they took off the heat. That night I took out the old packing and repacked the shaft as it should be, and the next day the engine under 60 lbs. pressure of steam drove the entire works, which the engineer claimed it had not done before while he had charge of it. This engine had been running several years.

Had the Avery engine been built with good metal journals on each side of the case, instead of running in hemp packing, I have no doubt it would have been a good engine for many purposes, and, as claimed for it, could have been cared for by an ordinary class of men, there being no valves to set, or pistons to pack, and there would have been little to get out of order.

Mr. Avery also built a locomotive, using a 6-foot arm. The engine was placed on a railroad, I think at Batavia, a railroad built at that time for carrying wheat from the surrounding country to the canal at Rochester. After running there some time, it not answering their expectations, it was taken to the shop and sold, and then taken to a road in New Jersey and experimented with, and given up as a failure. The noise from the escaping steam and revolving arm could be heard for miles, frightening the cattle and horses on the surrounding farms. There was no reversing arrangement for the engine, nor force pumps to feed the boiler. In place of the pumps a large round tank some 2½ feet in diameter by 8 feet in length was placed on the top of the boiler, made of heavy iron, capable of standing the same pressure as the boiler. A pipe on the bottom of the tank was connected to the top of the boiler, with a stop cock between the tank and boiler. This pipe reached nearly to the bottom of the boiler. Another pipe made a connection from the steam dome to the top of the tank. In feeding the boiler with water the steam cock was opened first, getting the boiler pressure on the water tank, then the lower water cock was opened and the water would feed into the boiler by gravity.

The experimenting with this locomotive was the ruin of Mr. Avery financially, and his backers took his works and endeavored to make a success of the engine for power purposes, but they neither of them being mechanics, but hardware merchants, had to depend upon hired managers to carry on the works, soon used up a fortune and they become poor men. Wm. B. Dunning.

Heating Foundries by Steam.

Editor American Machinist:

Mr. Shaffer very kindly disagrees with me in regard to heating foundries by steam. I am still of the opinion that steam heating is to be preferred in most cases. The foundry I had charge of in Boston, Mass., was 85 by 73 feet. It was my custom to bring in all large flasks the first thing in the morning. I did this with my helpers and not with moulders. I never allow moulders to bring in flasks when I can hire a man to do that work for $1.50 per day. By bringing in the flasks in the morning you can keep the shop warm with steam. The bringing in of small flasks during the day will have no more effect than a person passing in and out the shop. Perhaps the shop Mr. Shaffer has reference to was heated by exhaust steam and not by live steam. That makes a vast difference. The foundry to which I refer was heated by live steam, and the coldest days we had the shop was warm and comfortable.

The dislike I have to stoves is this: The man working near the stove is always complaining that it is too warm; and the man working up near the wall of the shop complains that it is too cold to finish his mould.

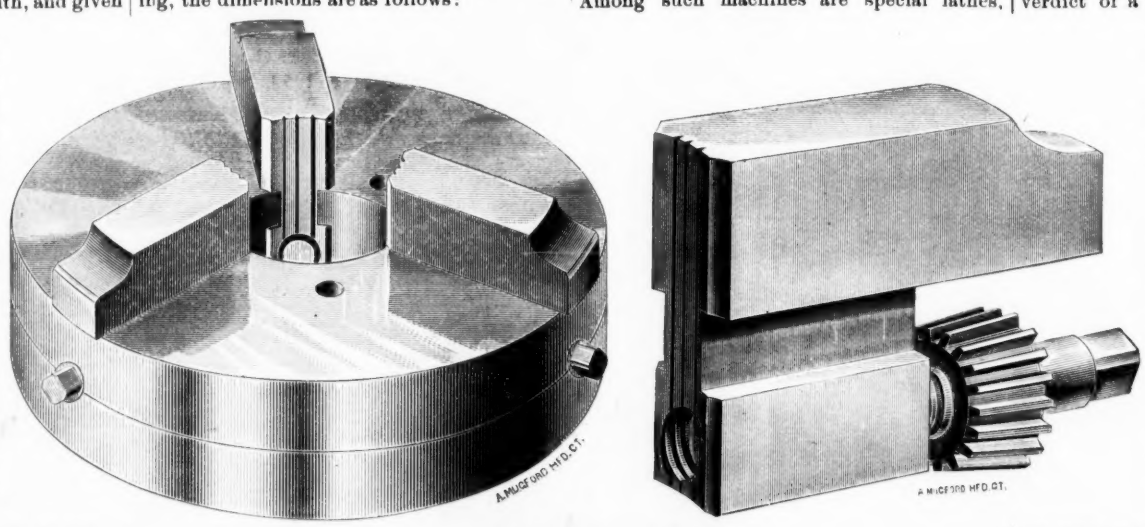
The only point in favor of the stove is, as Mr. Shaffer says, where you bring in a flask all over snow and ice you can melt the snow and ice off much quicker than with steam pipes. But the moulder near the stove does not like that, yet it has to be done.

I do not believe that moulders that are working in warm shops should ever go out in snow and rain looking after flasks. As Mr. Shaffer says, it takes them some time to get warm again. David Spence.

The Horton "Giant" Chuck.

The engravings represent a special chuck made by the E. Horton & Son Co., Windsor Locks, Conn. It is much stronger than their chucks for ordinary use, being designed for cutting off lathes, and for rough heavy work as in rolling mills. It is made in four sizes, either universal or independent, viz., 15 inches diameter which swings in 16 inches, and has hole $4\frac{9}{16}$ diameter through center; 16 inches diameter, swings in 17 inches, $4\frac{9}{16}$ inch hole; 17 inches diameter, swings in 18 inches, $5\frac{9}{16}$-inch hole diameter; 18 inches diameter, swings in $19\frac{1}{4}$ inches, $5\frac{9}{16}$-inch hole.

Of the particular chuck shown in the engraving, the dimensions are as follows:



The Horton Giant Chuck.

Diameter of body	18	inches.
Thickness of body	$4\frac{1}{4}$	"
Hole through center	$5\frac{9}{16}$	"
Swings in	$19\frac{1}{4}$	"
Diameter of recess in back for face plate	11	"
Distance between centers of bolt holes	$7\frac{1}{2}$	"
Thickness of shell	$1\frac{1}{4}$	"
Diameter of driving screws	$1\frac{1}{8}$	"
Distance from bottom of recess for lathe face plate to face of jaws	$4\frac{1}{4}$	"

Jaws above face of chuck, $2\frac{1}{4}$ inches wide, 2 inches high.

Holds work from $1\frac{1}{8}$ up to $5\frac{1}{2}$ inches diameter.

It weighs 197 lbs., smaller sizes in proportion.

For cutting up stock it will carry a shaft of any length while being cut up, without danger to the chuck.

Something in the way of variety is desirable, for which reason one of the latest strikes has merit. It is not a strike of workmen this time, but a blow by the business men of Rochester at what they term the telephone monopoly in that city.

In Germany they are becoming exercised over the steam gauge question. They find that not only the ordinary gauges, as sold, are far from being correct, but that those sold for test gauges are little better.

By a recent Austrian invention, iron is given a silver surface by covering the iron with mercury and silvering by the galvanic process; then by heating the iron to 300° C. the mercury is evaporated, and the silver firmly fixed.

Intrinsic Value of Special Tools.

By Oberlin Smith, Bridgeton, N. J.

A paper read before the "American Society of Mechanical Engineers."

In a paper read before this society last May, entitled "Inventory Valuation of Machinery Plant," the writer referred to "special tools" as the most difficult things to deal with in all inventory-taking. This is on account of their peculiar liability to become obsolete, or partly so, over and above all other kinds of manufacturing property. Assuming that we are here dealing with such tools as are used in the various branches of manufacture with which the mechanical engineer comes in contact, we may briefly define the term "special tool" as a tool which is individually adapted for performing some particular operation so well that it is unfit for general work—in other words, it is a specialist. Used in its general sense, the term in question covers both special machines and special tools, if such a distinction can be made. In the former category are many machines which can be profitably modified, in case the commercial demand ceases for the goods upon which they are specially made to operate, so as to use them for other purposes. Among such machines are special lathes, drill presses, milling machines, punching presses, etc., which retain enough of the general character of the type of machine after which they are named, to enable them to be altered over for other kinds of work, either general or special. An example of this has been seen in the case of gun-factories adapting such plant to the production of sewing machines or type-writers, at comparatively small expense, when the demand for fire-arms lessened.

Among special tools proper, are usually counted jigs, templets and gauges. To this list should be added working drawings and foundry patterns, as explained in the paper referred to. These drawings and patterns, though used in every machine shop, are essentially of exactly the same nature as are the jigs, etc., used in the large manufactories where work is so cheaply made on the "duplicate system." The general principles for the valuation of such tools are clearly laid down by the writer in the former paper, and are to the effect that each article should be rated at what it would cost to reproduce it to-day, less a depreciation for its wear and tear, and another depreciation for its percentage of obsoleteness. As stated, the wear and tear does not amount to much on this class of tools, because they are not ornamented for marketable purposes (so that they grow shabby with age); and because they have to be kept up to their original standard of working condition in order that they may do their work properly. The only question, therefore, nesessary to consider in this paper, is their amount of obsoleteness; and this is a very important consideration to the manufacturer having a large amount of money invested in such plant, when he is considering its intrinsic value.

Concerning this subject, there are two principal schools of belief, with a practice, in individual cases, ranging all the way between the extreme views held on either side. The first of these views is the one expressed in the former paper, namely, that a special tool should not be reckoned as partly obsolete while in the full career of its usefulness, but that very careful watch should be kept for any indications of a lessening demand for the merchandise which the tool is made to produce. The moment such indications appear, depreciations should commence and should be made rapid enough to be surely on the safe side, and to bring the value of the tool down to nothing but what it is worth for old material, before said marketable demand has entirely ceased. Of course good judgment is as necessary in this matter as in managing all other kinds of property. A catastrophe, causing a demand for goods wholly and suddenly to cease, although possible, is not likely to happen. If such does happen, for instance, by earthquakes occurring all over a country hitherto unaffected by seismic disturbances, and suddenly annihilating the demand for some article which the tool-owner manufactured for non-earthquake-proof buildings, but which is useless for the modified buildings replacing them; or when some original and brilliant invention makes a new article suddenly popular, and entirely throws out all its predecessors; or when some fashion in dress is rapidly changed by the verdict of a foreign fashion-monger, as was shown in the decadence of hoop-skirts some years ago. It is very rarely, however, that such occurrences amount to catastrophes. In such instances as the last two named, the change is not so sudden as to prevent a shrewd manufacturer from foreseeing the prospective state of things, and ceasing his production gradually. Of course, if his whole capital is invested in tools for one particular article, catastrophes or semi-catastrophes may occur regarding it, just as in the case of the merchant who has put all his property into the cargo of one wrecked ship, or into a mine where a promising vein of ore stops at a sudden fault. Such risks must be taken in all businesses, and can only be guarded against by a proper system of insurance. The wise course, in this as in the other cases mentioned, is to divide up one's investments in such a way as to run the risk of loss in only one direction at a time.

The opposite view regarding valuation of special tools, and one which is held by many shrewd and careful manufacturers, is that they should be depreciated by a large percentage every year, until their value stands *nil* upon the inventory. One popular belief is that a special tool hasn't any value at all until it has paid for itself in extra profits. Carrying this latter principle to a logical conclusion, it should be rated first at nothing, and gradually "appreciated" up to full price. All this is, of course, working upon the safe side, as regards the danger of over-valuation; but it is difficult to see how a corporation, for instance, could account to its stockholders for the money which they paid in, if all the plant happened to be of this special nature. An inventory upon such a basis would also be rather an awkward document to show to would-be purchasers of the business who were to be assured of its prosperity.

An esteemed friend of mine, who has been a very successful manufacturer of cotton machinery, is in the habit of depreciating many of his special tools to almost nothing upon his books, fearing they may pass out of use and cannot be made available for other purposes. I recently called his attention to the logical discrepancies in such a method, putting the case something like this: "Regarding valuation of special tools, I rate them at the bare cost of reproduction, and this only when they are in frequent and regular use. The moment such frequency lessens, or there is any doubt about their continued usefulness, they are heavily depreciated. Thus, at any time, all the plant of a shop is

worth fully its recorded value, to any purchaser who might buy out and run the business, providing the business is successful. Of course, if it is unsuccessful, and is to be sold at auction, it, or any other kind of business, could not realize cash for its assets to an amount anywhere approaching their valuation. If your principle were carried out, a mile of railway embankment, on a prosperous and paying route, would not be worth as much as the real estate upon which it stood, because somebody might want to buy it for a canal, and the grading would all have to be turned inside out, so to speak. A successful mine would not be worth nearly its cost, because it might be sold to be used for farming land; and any machine shop might attach but little value to any of its plant, except perhaps the buildings, boiler and engine, because somebody might want to buy it for a laundry. According to your system, would it not be the case that a new manufacturing company, having just invested a large part of its capital in the most approved plant for its purposes, would be obliged to say to its stockholders: 'Gentlemen, our assets last week, when you paid in your money, were $100,000; but they are now only $50,000, as much of this plant could not be sold for other purposes than those intended by its makers, for nearly the sum which we yesterday paid."

The most pertinent point in his reply was that mining property is always considered as incurring extra risk, and is expected to pay a much higher profit (say four to one) than other property, in order that said risk may be covered. This is true, but if the same principle is applied to special tools, and their intrinsic value is considered to be only, say, one-fourth of what it would cost to reproduce them, then occurs the insurmountable difficulty above referred to: How shall the managers of a property account to its owners for the full amount of the funds placed in their hands, the day or week after having purchased their tools, if a considerable share of such purchase has been depreciated 75 per cent. when first entered in the books? If the plan is adopted of entering them at full price in the beginning, and then depreciating them very rapidly, although in as full, or fuller, use than at first, what becomes of logic and common sense? If a tool is in perfect order five years after it is put into operation, and is used in making goods the demand for which has increased, without an apparent probability of a decline, why is that tool not worth as much to its owners as it was at the start?

In practical dealings with this question, it seems to me that the best course is to give all special tools an inventory rating at their apparent value, according to the principles enunciated in the former paper and the first part of this, and then to lay aside a portion of the extra profits which these tools have earned by their special usefulness, in the genera reserve fund or "surplus" of the concern They may thus be drawn upon, should any too sudden collapse in values take place. This surplus-keeping is a safe course (just as it is in the general conducting of the business in reference to strictly commercial risks), and a wiser one than to pay out all the profits which these tools earn to the partners or stockholders—thus leaving them in a disappointed state of mind should a shadow of obsoleteness gather rather suddenly and darkly over the special property in which their money is invested. Just how far to carry surplus keeping in general, as a matter of self-insurance against all kinds of losses, is a question for individual judgment, the discussion of which is scarcely germane to the purpose of this paper.

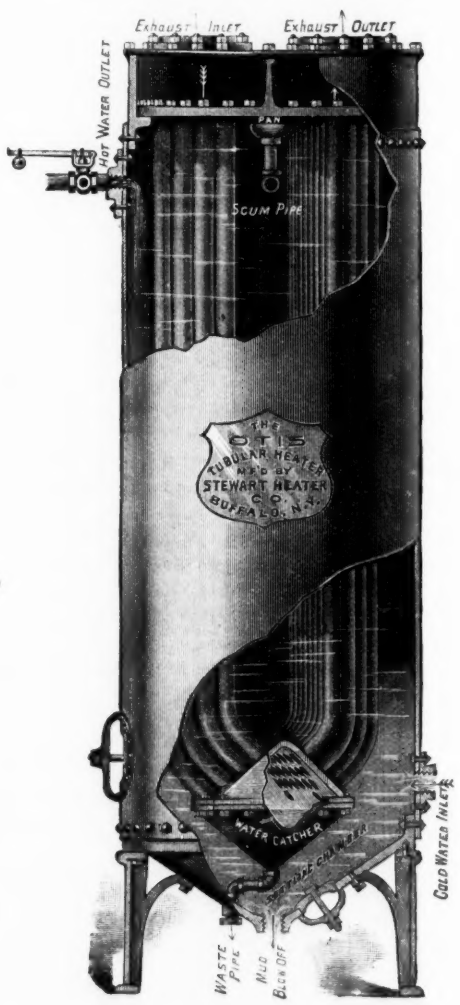


Fig. 1.

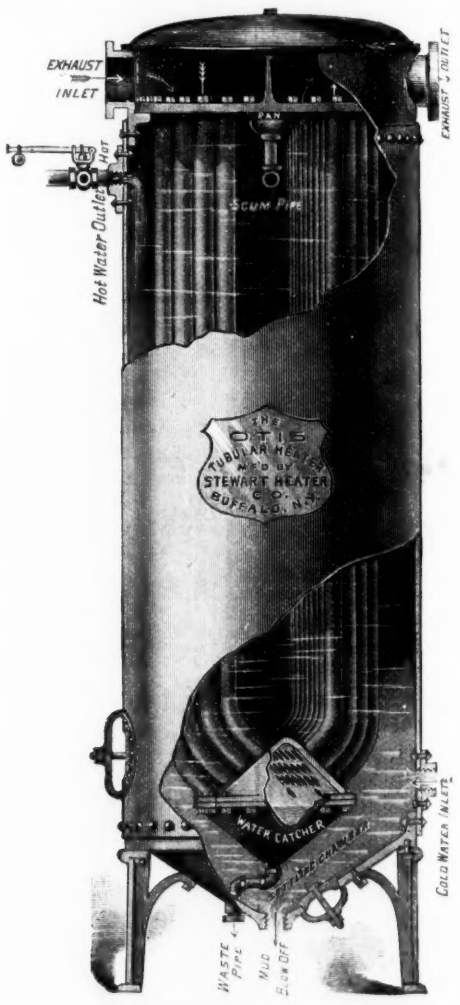


Fig. 2.

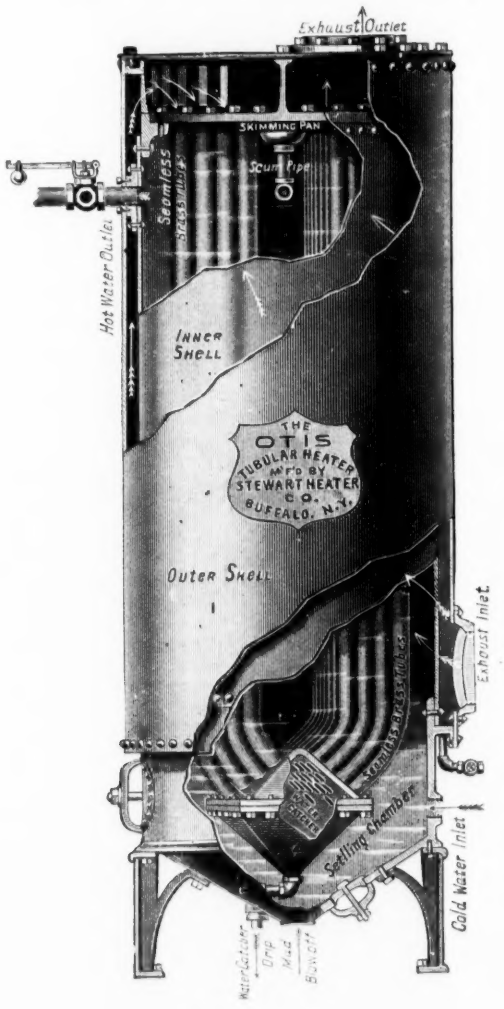


Fig. 3.

THE OTIS HEATER.

The Otis Tubular Feed-Water Heater.

Fig. 1 represents this heater with the outer shell cut away to show the internal construction and give an idea of the arrangement of tubes, water catcher, skimming-pan and setting chamber.

The cylinder or shell is made of A No. 1 boiler iron, or of steel, and is riveted to the heavy cast iron conical bottom made to sustain a high pressure. The bottom is made conical, so that the mud and sediment that collects in the settling chamber will be blown out through the mud blow-off at bottom of heater.

The top end of the shell is riveted to a heavy cast-iron ring, which has a projecting rim or flange cast upon its inner surface, to which the tube sheet is strongly bolted.

The object of attaching the tube sheet in this way is so that by simply unscrewing the bolts holding it, the tube sheet, tubes and water catcher can be withdrawn without disturbing the outer shell of heater, or disconnecting any of the feed pipes. The tube sheet is made extra heavy, and has a rib or brace cast across its center, adding to its strength and also forming the dividing partition between the inlet and outlet of the exhaust.

The tubes are made of seamless drawn brass tubing, are expanded into the tube sheet and water catcher, same as in a boiler, and are of suitable thickness to withstand double the pressure that will ever be required of them. They are bent at the lower end to an angle of 45°, so as to make proper connection with water catcher; this also allows them to expand and contract freely, thereby overcoming the difficulty of keeping the tubes tight.

The water catcher is new in this connection. As the exhaust steam passes down through the tubes into the enlarged space of the water catcher the water of condensation will be separated from the steam and be carried off through the waste pipe, in most cases doing away with a water catcher on the top of the building.

The settling chamber is made large, so as to allow all the mud and sediment to settle in the bottom, where it can be blown off through mud blow-off or taken out at the man-hole in the side of heater.

The man-hole provides for thoroughly examining and cleaning the internal parts of the heater without disconnecting a pipe.

The skimming pan is for collecting the surface scum, which can be blown off through the scum pipe at the side of heater.

From the construction of the heater the exhaust steam passes twice through the entire length of heater, giving, it is said, one square foot, or more, of heating surface to each horse-power.

The water capacity of the heater is large, which affords time for the sediment to settle, thus purifying the water.

Fig. 2 represents the heater with inlet and outlet on the side.

Fig. 3 represents the heater made with a double shell, or steam jacket, and lime extractor. The internal construction is similar to Figs. 1 and 2 with these exceptions.

These heaters are furnished plain, or when required they will be encased in black walnut held by brass bands, with asbestos between the shell and wood.

The manufacturers are the Stewart Heater Company, Buffalo, N. Y.

According to a report of U. S. Consul F. H. Mason, at Marseilles, the iron industry is considerably depressed in France, and prospects not very bright. He says:

The visitor to the metal and mining districts of France is impressed everywhere with the idea that the iron and steel industries are exotic in this country. The Frenchman is not by nature a miner or an iron maker. As a manager he is plodding and conservative, slow to adopt new ideas and processes, and given to repairing his old machinery instead of replacing it with new and more effective apparatus As a workman he is careful and industrious, but slow and perfunctory, doing mechanically what he is taught, working against time with the single purpose of earning his wages. An intelligent foreman in one of the iron mills of the Gard says that he would gladly pay English or Welsh workmen double the wages per day that are paid to Frenchmen for similar kinds of labor. The few British operatives who are employed on piece-work in these establishments uniformly earn twice as much as native workmen of the same class. At several silk factories in the same and adjoining departments it has been found that English women could operate simultaneously two looms, while their French sisters could attend only one.

A comparison of the industrial statistics of France with those of England and Germany shows that a French machinist receives 7 francs for the same labor that a German will do for 4. Coal costs on an average 11.50 francs per ton in France, against 5.50 francs in Germany and England. Ore, as estimated on the basis of its real value for producing iron, costs 4 francs per ton in England, 5 in Germany, and 6.50 francs in France.

France has a protective tariff and seems to have markets at home for a pretty good share of her products. On the above showing there is nothing to attract workmen to Germany or England, but in France they are paid good wages. Perhaps this is why so few Frenchmen emigrate to the United States, while the influx from Germany and Britain is so great.

The State Railway Council of Germany has forbidden the employment of men in active service on the railroads beyond eight hours daily. This is a wise provision, and will no doubt be the means of preventing accidents. A great many disastrous smash-ups have occurred in this country because some overworked railroad employe neglected to turn a switch or display a signal. Where required to work twelve to fifteen hours a day accidents may be expected.

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NEW YORK, DECEMBER 11, 1886.

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Claiming too Much.

The comparatively slow progress of electric lighting in its earlier days is an example of the evil effect of claiming too much for a good thing. If efforts to introduce it had then been based more upon its superiority and less upon exaggerated representations of its low cost, there is every reason to believe that it would have come into use much more rapidly than it did. For the purposes for which it is specially adapted, and they are numerous, the electric light is really cheap, but when customers buy something and do not get all that it is represented to be they are dissatisfied, notwithstanding they get more than full returns for their money.

If a man using a steam engine that requires six pounds of coal per horse-power buys a new one which he is led to expect will require but two, he will never be satisfied to pay for three pounds. If the representation of the builder had been three pounds he would have been entirely satisfied, and would have figured a handsome profit on the investment, where he now sees a loss.

All at once New York city officials have discovered that they have some authority in the matter of regulating the treatment of workmen on the aqueduct. The shameful disregard for life and the lack of all sanitary precautions on the part of the contractors for that work has been repeatedly brought to the notice of these same officials, but heretofore they have claimed that they had no jurisdiction in the matter. Suddenly, and apparently without any overwhelming mental effort, they discover that they have ample power. It will be interesting to note in the future how they use this power, as well as to speculate upon what has sharpened their wits with such suddenness.

A Good Example.

The following extract from a private letter contains in few words so much of importance to young men who are obliged to start in life without the proverbial silver spoon in their mouth, that we cannot refrain from giving it, premising that it is from a successful business man, who has been honored with large trusts in a business direction, and who has repeatedly served the citizens of the place in which he resides in high official capacity, and is now, at nearly seventy years of age, so serving them. The writer says:

I was bound an apprentice at fifteen years of age, and picked up a little education—sufficient to enable me to do business and manage a shop—by attending night school after I was married. No sooner was I prepared than the opportunity offered. I started with my hands, and was always ready to do anything that offered itself. I have found the world full of friends, ever ready and willing to help when help was needed.

There are too many young men that will go through life complaining that they "get no chance." The above is better than a two-hour sermon on how to make a chance; and that is what the vast majority of men must do. Being ready and willing to do what offers, and to do it well, with constant effort to learn something they do not know, has furnished the greater part of the successful men of this country with all the "chance" they ever had. Brooding over the erroneous idea that there is no chance has kept thousands of others from succeeding. The young man—it don't matter whether he is apprentice in the shop or trying to learn in any other position—who is afraid he will do something he is not paid for doing, is the one who will never get a chance.

It might be a good thing if the inclination was to boost those who do not possess sufficient energy and perseverance to help themselves; but it is not so, and it never will be. The man that works hard to help himself—fairly and honorably, but persistently—is the one that will find "the world full of friends."

Without making a text of the quotation, there is one other thing in it that carries a moral as true as any ever uttered, although it is very generally disputed. That is that when a man fits himself by education of any kind to do something better than it is now being done, he finds an opportunity to use his knowledge. There are undoubtedly exceptions to this, as to any general rule; but the majority of those that think they do not find it true overlook something in themselves that others see.

A Glass Combination.

The window glass manufacturers of Pittsburgh and the West have formed a syndicate to regulate prices and control production. The press dispatch says:

"The details of the combination cannot be given, but, as contemplated, will secure a steady market at reasonable prices, and will prevent all ruinous competition. It is understood that the Eastern manufacturers have under consideration a similar plan."

These manufacturers combine against the public, but when their workmen combine against them for like purposes, viz.: to secure steady work at reasonable wages and prevent ruinous competition by limiting the number of apprentices, the movement is generally denounced as inimical to industrial progress and prosperity. If the combination is wrong in one case it is wrong in the other. On general principles an association for mutual protection is good in any trade, for self-preservation is the first law of nature. Those that combine themselves should never deny the same right to others.

Water Works in Villages.

The Rutland (Vt.) *Herald* says:

South Royalton and Townsend have been swept by fire. In neither place was there the slightest means for putting out fire.

There are many large villages in the country that could profit by experiences of this kind The building of water works is delayed long after the necessity, because the cost is looked upon as burdensome. Often water works would, indirectly, be a source of revenue, to say nothing of their value in the instance of an extensive fire. A liberal supply of good water is looked after by manufacturers, and is a strong incentive to their location. In the establishment of water works it is not always wise to look too long after a source of supply by gravity, and to go too far to get water in this way. Sometimes the cost materially overbalances the saving. Pumping machinery has been so simplified and cheapened that it is often cheaper and more satisfactory to pump from near at hand than to bring from a long distance by gravity. This is especially true where the quantity of water required is not large, since the cost of a plant for a small supply is almost nominal.

A Polytechnic "Section."

A circular has been issued by the "Polytechnic Section" of the American Institute, which has been accustomed to hold weekly meetings in Room 24 Cooper Institute, New York. For a year or two, however, this section has seldom been heard from. In its most active condition, this club, society or branch, attracted considerable attention by the lectures and discussions on mechanical and scientific topics at its regular meetings. The project now started is to reorganize "on the same general plan as the world-renowned Franklin Institute of Philadelphia."

The plan is to hold meetings on the second and fourth Thursdays of each month, except during the summer, in the hall of the Institute on Astor Place. Lectures, the reading of papers, discussions, and the exhibition and description of "new and meritorious inventions" will occupy the time at the meetings. The increase of the present library of 15,000 volumes and the collection and indexing of illustrated trade catalogues are to be looked after. The movement is to be without cost to those who first come in simply as members of the section, or attendants on its meetings. D. R. Garden is secretary.

Occupations of Graduates.

The catalogue of the Worcester Free Institute, Worcester, Mass., shows that fifteen classes have been graduated, numbering 327 students, who completed a three year's course. In the classification of the occupations of graduates it is noted that there are 32 partners in business firms, 34 superintendents, four chief engineers, four division engineers, seventeen assistant engineers, twenty-four civil engineers, forty-six draftsmen, fifteen mechanical engineers, ten machinists, two road masters, six foremen, fourteen teachers, eleven chemists, four advanced students and five designers. Seventeen have died and there are eighty-two whose occupations are not classified. We do not know of another technical school in the country that makes as good an exhibit of the occupations of graduates. The catalogue gives a list of graduates by classes, with present occupation and residence.

Railroads in China.

The China Improvement Company, which is to supply railroads to the Celestial Kingdom, and to maintain them there, was incorporated Nov. 16th, with a capital stock of $200,000. Its corporators are Joseph F. Smith, Murry Corrington and James Hepenstall, Jr. Its directors are: Charles Vincent Smith, who resides in Shanghai, China, and is connected with the house of Russell & Co., importers and shippers; Gen. James H. Wilson, civil engineer; Samuel L. M. Barlow, lawyer; John M. Forbes, and Richard Suydam Grant, president of the Grant Locomotive Works, Paterson, N. J.

The survey of the road is to be made at once, and the grading is to commence early next spring. The road is to extend from Tientsin to Taku—a distance of about 37 miles. Unusual difficulties will not be met with, as the country in which this railroad is to be built is perfectly flat. This road is a great necessity, owing to the growing trade between Tientsin and northern China.

There is in summer a water communication between Tientsin and Taku, by the Pei Ho River; but this river freezes up solid during the severe winter months, causing a suspension of all trade until warmer weather arrives.

In building this road the great obstacle to be overcome is the prejudice of the people against all railroads, in which the Chinese believe the evil one is incorporated. Again, the Chinese people do not bury their dead in cemeteries, but bury their departed friends in their own ground, or rather, make a tomb above the ground. How to build a railroad without interfering with these private burial places may be another tough problem to solve.

Literary Notes.

The Report of Proceedings of the Sixth Annual Meeting of the American Water Works Association, held at Denver last June, is a volume of 134 pages. Among the topics discussed are: Discipline in the Pumping Station; Fungus or Mossy Growth in Clear Water; Lead Poisoning; Steam Boilers, their Settings, and the Relation of Private Water Companies to Municipal Authorities.

Among the topics for discussion at the annual meeting to be held at Minneapolis, July 13, 1887, are: Ground Water; Water for Public Supplies; Recording Gauges for Steam and Water; Private Water Companies; Revolution Counters; Is Water Property; Hydraulic Elevators; Natural Filtration; Should Storage Reservoirs be Open or Covered; Fungus or Mossy Growth and Local Distribution of Water. The secretary is J. H. Decker, Hannibal, Mo.

The Transactions of the American Institute of Electrical Engineers, Vol. III., is before us. It is published by the Institute at the office of the secretary, Ralph W. Pope, 16 Dey street, New York. The volume embraces the papers read and discussions carried on at their meetings. Among the subjects thus treated are: Underground Electric

Systems; Some Recent Advances in Tele phony; Static Difficulties in Telegraph Wires, and Secondary Batteries for Light and Power.

The Iron Review and Railway Magazine, of Buffalo, is a sixteen page monthly journal devoted to industrial matters. It presents a very neat appearance and is well illustrated. One dollar a year.

If publishers of newspapers and magazines who roll them into a wrapper for mailing would visit their subscribers and see how many of them are thrown aside without being opened, they would change their style of wrapping. It is about as much of a job to open such a package as to open a tin can of peaches.

The Western and Atlantic Railroad, which runs between Atlanta and Chattanooga, have published a well-written and finely illustrated pamphlet called "The Mountain Campaigns in Georgia, or War Scenes on the W. & A." The cuts were prepared by A. R. Waud, who personally visited all of the battle fields depicted, and the maps are based on Sherman's maps of the Atlanta campaign. The pamphlet is issued for the information of tourists, and it is very interesting.

QUESTIONS AND ANSWERS.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly, and according to common-sense methods.

Every question, to insure any attention, must invariably be accompanied by the writer's name and address. If so requested, neither name, correct initials nor location will be published.

(421) W. E. C., Owatona, Minn., asks: 1. Is there a successful rotary engine in use? *A.*—That depends upon what you understand by successful. 2. Is there a rotary engine made that uses steam expansively as economically as the ordinary steam engine? *A.*—No. 3. What is the nearest approach to this, so far as you know? *A.*—We have no decided opinion upon the subject.

(422) R. K. asks: 1. What is the best speed for the line shaft for a machine shop? *A.*—The common practice is from 100 to 120 revolutions per minute. 2. What is the best speed for a countershaft for a 12-inch engine lathe? *A.*—This speed is usually fixed by the design of the builders of the lathe. We cannot give any "best speed," except to say that it should be such that, with the pulleys furnished, it will give the correct speed for the lathe.

(423) *Contrary*, in relation to the answer, in Question 413, writes: 1. I want to know how the engineer is going to start one side of his engine with the other side blocked against the cylinder head. *A.*—If the engineer does not know enough to take off the main rod on the crippled side of engine, after he has blocked the piston against the cylinder head, he is not competent to run an engine of any kind. 2. What will happen to the mate of the broken strap or rod in the present condition? *A.*—This should be disconnected also, so that nothing will happen to it.

(424) J. U., ——, asks: 1. I have a boiler the outer shell of which is 40 inches by 5½ feet, and the inner shell 36 inches by 5½ feet, leaving 2 inches steam and water space. Can a coil of 1-inch pipe be placed within the above, and water fed through it just fast enough to discharge steam at the top? *A.*—As we understand you, the pipe will be coiled above the fire. It will discharge both steam and water at the top; the steam that is made in the lower part of the coil will carry water along ahead of it and out at the top. 2. What are the smallest ports that can be successfully used with a 7"x7" cylinder, running 250 revolutions, the valve to have no steam lap? *A.*—A valve with no steam lap will not give good results under any circumstances. You can do fairly well at that speed with steam ports ¼ inch by 5 inches; exhaust port, 1 inch by 5 inches.

(425) J. D. asks: 1. Is there any standard taper for piston-rod ends? *A.*—No; but ⅛ of an inch in 4 inches is generally considered to be a good taper. 2. Is it a poor plan to use piston rings taken out of a cylinder which needs reboring in a new cylinder of the same size? *A.*—It is a very poor plan. 3. I think that a chuck fitted for a new lathe should be rather tight on the new spindle and a little shaky on the old lathe spindle. Am I right? *A.*—Yes. 4. How much power applied to the end of the lever of a screw 3 inches in diameter, and working in a nut 8 inches deep of babbitt metal, will be consumed by friction? *A.*—About 70 per cent. 5. To what size must I turn the ends of a large gas pipe on which threads are to be cut? *A.*—Turn the ends to a taper of 1 in 32 to the axis of the pipe; or, in other words, turn the ends to a taper of ⅛ of an inch to the foot.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Wednesday for the ensuing week's issue.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

J. Clayton, Air Compressors, Rock Drills, 43 Dey st, NY

Edw. Sears, Wood Engraver, 169 William st., N. Y.

Steel Name Stamps, etc. J. B. Roney, Lynn, Mass.

Solid Nickel-Seated "Pop" Safety Valves. Consolidated Safety Valve Co., 111 Liberty st., N. Y.

Selden Packing, for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt st., NY

The Best Upright Hammers run by belt are made by W. P. Duncan & Co., Bellefonte, Pa.

Light articles built to order by the American Sewing Machine Co., Philadelphia, Pa.

R. Dudgeon, 24 Columbia st., New York, Improved Hydraulic Jacks and Roller Tube Expanders.

Davis Key-Seating Machines, kept in stock, by Manning, Maxwell & Moore, 111 Liberty st., N. Y.

Pattern and Brand Letters. Vanderburgh, Wells & Co., cor. Fulton and Dutch sts., New York.

20", 25," 28" B G. and S. F. upright drills for immediate delivery. Currier & Snyder, Worcester, Mass.

The best wire nail and tack and nail machinery. Wm. A. Sweetser, Brockton, Mass.

Ice and Refrigerating Machines. 120 built, and all successful, by David Boyle, 521 Monroe, Chicago, Ill.

Inventions, Models, Gear-cutting and light mechanical work. A. P. Brown, 108 Liberty st., N. Y.

20,000 addresses of steam users and users of mach. in 10 States, $10. J. N. Mills Pub. Co., 30 Vesey st., N. Y.

"How to Keep Boilers Clean." A book mailed free, by James E. Hotchkiss, 93 John st., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys Yocum & Son's Shafting Works, Drinker st., Philadelphia, Pa.

Rubber Belting, all sizes, 77½ per cent. regular list. All kinds of Rubber Goods at low prices. Jno. W. Buckly, 156 South street, New York.

Engine Lathes, Hand Lathes, and other fine tools, Assortment large; prices low. Frasse & Co., 92 Park row, N. Y.

Machinists' supplies, brass goods m'f'rs supplies, polishing materials, all kinds wire, metals, etc; in any quantity. Jordan & Gottfried, 208 Canal st., N. Y.

The Improved Tabor Steam Engine Indicator, made and sold by The Ashcroft Mfg. Co. 111 Liberty st., N. Y.

Handbook on the Care of Boilers. 50c. Descriptive Circular and Catalogue of Books for Mechanical Engineers free on application; special terms to Mechanics' Libraries. E. & F. N. Spon, Publishers, 35 Murray st., New York.

St. John Improved Self-adjusting Cylinder Packing, for marine and stationary engines and locomotives; applicable to water, air, oil and ammonia pumps. For durability and minimum of friction, it is unexcelled. Send for pamphlet. Address, Balance Valve and Piston Packing Co., room 58, 280 Broadway, New York.

Patent Binders for the AMERICAN MACHINIST, holding a complete volume (52 issues), simple, neat, durable. Price $1, prepaid, to any part of the United States by mail. To Canada or foreign countries the price will be 75c.; purchasers pay express charges and customs duties. AM. MACHINIST PUB'G CO., 96 Fulton st., N. Y.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator, and making all required calculations from the diagram; also the principles of economy in operating steam engines, and current practice in testing engines and boilers. Price, $2 post-paid. Published by John Wiley & Sons, 15 Astor Place, New York

MANUFACTURES.

John Wildy, Uniontown, Pa., will erect a new wagon factory.

The Jersey City Steel Works contemplate removing to Scranton, Pa.

Clausen's brewery additions in New York city will cost about $50,000.

The Toledo and Ann Arbor Railroad will build shops at Alma, Mich.

The Homer Wagon Company, Homer, N. Y., is to be removed to Utica, N. Y.

The new pipe mill of the Reading Iron Company, of Reading, Pa., will cost $12,500.

Wilson Bros., of Chicago, will build a factory at South Bend, Ind., to cost $30,000.

The Reading Brewing Company, of Reading, Pa., will erect a brewery to cost $14,500.

The business men of Susquehanna, Pa., have subscribed $10,000 for a silk factory.

The Higgs and Test Wire Nail Works, of Sharon, Pa., will shortly be removed to Meadville.

The Dixon Crucible Company, Jersey City, N. J., is building a large workshop on Wayne street.

The Bethlehem Iron Company, Pa., is enlarging its works, to accommodate increasing business.

The Hall Rubber Company, Ætna Mills, Mass. (P.O., Watertown), is building an addition, 160x180.

Henry Disston & Sons, of Philadelphia, are experimenting with gas in their steel melting department.

It is believed that the sum of $25,000 will soon be subscribed in Warren, Mass., for the shoe factory project.

The Holly Manufacturing Company's new building, Lockport, N. Y., is rapidly reaching completion.

The Phœnix Plumbago Company, Phœnix, Pa., is erecting new buildings, and will put in additional machinery.

The I. P. Morris Company, of Philadelphia, will soon build a two-story machine shop as an addition to their plant.

The works of the Roberts Machine Company, at Collegeville, Montgomery County, Pa., are being enlarged.

The Hazleton and Delano shops of the Lehigh Valley Railroad Company are busy turning out locomotives.

The Edison Machine Works are gradually removing their machinery from Goerck street, New York city, to Schenectady.

The Baldwin Locomotive Works, Philadelphia, are to furnish the Union Pacific with fifteen of their standard freight engines.

The Baldwin Manufacturing Company, refrigerator manufacturers, at Burlington, Vt., contemplate moving to Winooski, Vt.

The Detroit Knitting and Corset Company, Detroit, Mich., will erect a three-story brick machine shop at 121 Seventh street.

The works of the Novelty Cutlery Company, Canton, O., have been about completed, and will be running full in a few weeks.

M. McManus, 313 North Second street, Philadelphia, has a permit to erect a four-story factory, 35x49 feet, on Buttonwood street.

Godey & Strom, of Chicago, will erect a $12,000 machine shop at 350 Hawthorne avenue. It is 160x125 feet and one story high.

The Georgia Central Railroad will erect a depot and machine shops at Birmingham, Ala., for its Goodwater and Birmingham extension.

The Talcott Foundry at Brightwood, Mass., has been purchased by John McFethries and Wm. C. Lawton, of Springfield, Mass., for about $16,000.

Frazer & Chalmers, of Chicago, have issued a pamphlet descriptive of the Frue ore concentrator or Vanning machine, and its method and operation.

Scranton, Pa., is enjoying a business boom. The shops and factories are full of work, and many new manufacturers have determined to locate in that town.

The Wisconsin Central Railroad Company will erect a large union depot next spring at St. Paul, Minn. It will be of native stone and brick, and will cost about $265,000.

It is said that a canning company, with a capital of $200,000, and plant worth $50,000, will soon commence preparations looking to operating, at West Lincoln, Neb., next season.

J. W. Pike, of Philadelphia, and Michael Reddy, of Little Falls, N. Y, are about to start a factory at the latter place under the name of the Pike Knitting Machine and Needle Company, and expect to employ 50 hands.

It is thought the Gilbert Car Company, of Green Island, will secure the Jones Car Works in Schenectady, N. Y., which are now unused, within the next month or two, and employ 200 men. Their business at Green Island will not be removed.

H. S. Kearney, engineer of the New York Subway Commission, is about to build a Newburg plaster mill on Ranton street, near Paige avenue, Brooklyn, N. Y. It will cost $30,000 and be of brick, 97x124 feet in diameter, with three extensions.

The Norfolk and Western Railroad Company has placed with the Roanoke Machine Works, at Roanoke, Va., an order for 1,000 cars and 12 locomotives. So great is the activity at this establishment that over 1,000 hands are now employed.

The Barbed Wire Manufacturers' Association, which met at Chicago recently, is said to have gained control of all the factories, and has ordered an advance of $2.50 a ton for wire on the 1st of January, in addition to the $5 a ton increase just gone into effect.

The Hudart Scale Manufacturing Company, of Cincinnati, will move their plant to St. Paul, Minn., and will begin this fall the erection of buildings, the main one to be 60x100 feet size, two stories high. The total value of the plant when moved will be $50,000.—*Sanitary Engineer and Construction Record.*

The New Haven Watch Company, which has during the past few years manufactured a timepiece something the style of the Waterbury watch, in the S. Peck & Co. factory, New Haven, is now transferring its business to Trenton, N. J., where the president, J. Hart Brewer, and the secretary, W. F. Van Camp, reside.

The erection of the largest boot and shoe manufactory between New York city and Chicago will be commenced by G. Harry Lester, of Lester & Co., at Binghamton next spring. It is to be of brick, 250 feet in depth by 100 feet in width, and five stories high, besides a high basement, making virtually six stories.

The Weatherford Iron Works, of Weatherford, Tex., write us under date of November 16: "We have started a general machine repair shop here, and expect to be in full blast in two weeks. Our machinery is nearly in position at present. There is also a new castor oil works just started up here. R. W. Kindle & G. M. Bower are the proprietors."

A movement is in progress at Old Orchard, Me., to start a small shoe factory there. It is intended to commence the enterprise with a stock of $5,500, which will include the cost of a building and equipments. The citizens propose guaranteeing the interest on the enterprise for a term of years, and a petition to that effect is now being circulated in the town.

The Straight Line Engine Company, Syracuse, N. Y., have recently delivered a 9"x12" engine to Clark's Mills Manufacturing Company; a 11"x16" to the Cohoes (N. Y.) Gas Light Company; two 9"x12" for electric lighting at the residence of Whitelaw Reid, New York; one 9"x12" to the Tivoli Hosiery Mills at Cohoes; and one 6"x12" to the Johns Hopkins University at Baltimore. Inquiries are numerous at the works.

The Savage Forge Works, Southington, Conn., agree to move their plant to Scranton, Pa., if people in that city will take $35,000 of stock out of the $100,000 complete capital. The money has been subscribed to buy the stock. Cheapness of fuel is said to be the cause of the removal. Culm has been found to burn in suitable furnaces just as well as coal, and Scranton has an abundance of it to give away.

The *National Labor Tribune*, of Pittsburgh, says: "Everything continues to move along with the utmost satisfaction in our iron and steel mills. About the only thing to cause an obstruction is the insufficient supply of natural gas at some of the mills. All that can be ascertained at the offices of the gas companies is that there are too many consumers, which is about to be overcome by several new wells being put down."

The Chrome Steel Works, of Brooklyn, N. Y., have concluded to substitute gas for coal in their heating furnaces. It will be necessary to tear out their old furnaces, and put in regenerators in their stead. The new plant will be complete in every respect, even to apparatus for the manufacture of the necessary gas, which will be made on the premises. This improvement will increase the productive capacity of the works twofold.

Work is progressing rapidly on Charles Whittaker's new brass works now in course of construction at Pennock, near this city. The building is four stories high, and covers an area of 50x100 feet. It is expected it will be ready for occupancy by January 1, when the works will be removed from the city to the new site. Mr. Whittaker will start in with about 150 employes.—*Chicago Industrial World.*

A new chalk or whiting factory is being built on the Greenpoint side of Newtown Creek, Brooklyn, N. Y., on the property recently purchased by Roswell P. Flower. The works will have a frontage of 200 feet on the creek, and will extend southward 125 feet, with an L extension of 30x50 feet. The building will be of brick, two stories high. It is estimated that the cost of the building will exceed $30,000; when the machinery and other appliances are in position the outlay will amount to $100,000.—*Building.*

The great property known as the Albany Iron Works is changing hands, and there is some talk of relighting the furnaces, which have been idle for the past three years. The property is being sold under foreclosure of mortgage. The mortgage is nearly half a million. The assets of the company consist of real property on the island south of Albany, N. Y., including two blast furnaces, with engines, boilers, etc.; a large manufacturing building with power; lands under water, lease of iron ore bed, switching engine, etc. The stockholders are discussing the emergency, and, should the works be reopened, they will give employment to a great number of workmen.

The United Brass Workers' Manufacturing Company, 5 East Fourth street, New York, is a co-operative company recently organized. In their circular of November 18th they say: "In entering the market as a manufacturing company, the United Brass Workers propose to work in a friendly spirit of competition with all other manufacturers. The company are practical brass founders and finishers, having ample capital, propose to manufacture only first-class brass work for plumbers, gas and steam-fitters, engine builders, railroad and water companies. It will not be by cutting prices that we shall build our trade, but to the contrary, by advancing the quality of the products. We come before the trade with the firm determination to make only such goods as will identify us as manufacturers of absolutely the best goods in the market, and earn for us an unrivaled reputation."

A press dispatch from Birmingham, Ala., says: "Business and industrial circles are interested in the news that capital to the extent of $3,000,000 is to be brought here to manufacture iron and steel by the sale of the Sloss Furnace Company's property, which was consummated in New York on Thursday. The transaction was effected by Major John W. Johnston, president of the Georgia Pacific Railway, and the bulk of the purchaser's money will be furnished by Richmond, Va., capitalists, whom he had already succeeded in interesting in this district to a considerable extent. New York contributes $100,000 of the capital. The present owners get $2,000,000 for the property. The buyers will make the capital stock $3,000,000, building two furnaces and probably an extensive steel plant with the extra $1,000,000. The property consists of two furnaces with an aggregate daily capacity of 225 tons, 250 coke ovens, forty miles of the iron veins of Red Mountain, 15,0 0 acres of brown ore land, 20,000 of coal lands, and two large lime rock quarries. Co'; Sloss, president of the old company, says it owned material enough to supply the furnaces for a hundred years."

J. W. Pike, of Philadelphia, and Michael Reddy, of Little Falls, N. Y., are about to start a factory at the latter place under the name of the Pike Knitting Machine and Needle Company, and expect to employ 50 hands.

Machinists' Supplies and Iron.

NEW YORK, Nov. 24, 1886.

The present and prospective condition of the pig iron market is just now receiving unusual attention, as upon that much of the probable condition of other trade depends. At the present furnacemen are not only holding prices firm, but believe they could easily make advances. This they are loth to do, as any material advance would lead to increased introduction of foreign brands. Users of large quantities of iron will soon be in the market for next year's supply, and a good deal of interest centers upon the prices they will get.

We quote: For American brands, No. 1 X Foundry, $19 to $19.50; inferior brands, $18.50; No. 2 Foundry, $17.50 to $18; Grey Forge, $16 to $17.

Scotch Pig—These brands are in only moderate demand. We quote Coltness, $21.50 to $22; Glengarnock, $19.50 to $20; Gartscherrie, $20 to $21; Eglinton, $19 to $19.50; Langloan, $21; Dalmelington, $19.75; Summerlee, $20.50 to $21.

Lead—There is a slight inclination towards higher prices for pig; 4.35c. is asked for spot delivery.

Spelter—Refined, 5¾c. to 6c.

Tin—The market is ruling a little higher, owing to better prices in London. Jobbing lots of Banca have sold at 23c. to 23½c.; Straits and Malacca, 22.75c.

Copper—There is no material change in prices. Arizona brands are quoted at 11c.; Lake, 12c. to 12½c.

Antimony—Hallett's, 7c. to 7½c.; Cookson's, 9c.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate, 30 cents a line for each insertion. About seven words make a line. Copy should be sent to reach us not later than Wednesday morning for the ensuing week's issue.

Good machinists wanted for work on knitting machines; liberal wages paid, but only good workmen need apply. Chas. Cooper, Bennington, Vt.

Mech'l draftsman, 12 years' experience on steam engines and special mach'y, wants situation in New York or vicinity. Address "Skill," AM. MACHINIST.

Wanted—Draftsman on general machine work. Address, giving references, experience and expected pay, H. J. R., AM. MACHINIST.

Wanted by Young Man—Situation in manuf'g establishment; understands drafting; willing and capable. Address "K," AM. MACHINIST.

Machinist foreman wanted, who can handle fifty men to advantage, and increase their production by latest improved ways of doing work. Address P., care Wilkinson & Co., 352 Atlantic av., Boston, Mass.

Wanted—Foreman to take charge of machine room; 35 hands employed; must have experience in duplicating work, and thoroughly understand milling machines, drill presses, turret lathes, etc. Address, the National Cash Register Co., Dayton, Ohio.

MISCELLANEOUS WANTS.

Advertisements will be inserted under this head at 35 cents per line, each insertion.

Crescent steel tube scrapers are unquestionably the best. Crescent Mfg. Co., Cleveland, Ohio.

Crescent boiler tube cutter, for setting new and removing old tubes. Crescent Mfg. Co., Cleveland, O.

Light mach'y of all kinds built at short notice Edmund Mills, 8 Dey st., Jersey City Heights, N. J.

John Lamberty, mfr. telegraph and electrical instruments, experimental machs, models; fine gear cutting a specialty. 35 S. 5th st., Br'kl'n, E. D., N. Y.

Special tools and machines for mfg. designed and built to order; mechanical and Patent Office drawings. Weston & Smith, Syracuse, N. Y.

Experimental and new machinery for special purposes built by contract from specifications and inventors' designs; ample facilities. Cohoes Iron Foundry and Machine Co., Cohoes, N. Y.

For Sale—Large sizes of Screw Plates for bolt and pipe work, advertised recently, are all sold. I still have a few equally as good bargains in the small and medium-sized Plates, Taps and Dies. S. M. York, Cleveland, O.

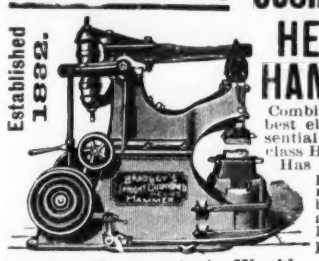
For Sale—One complete set of Pulley Patterns also Patterns for Slide Valve Engines, with adjustable cut-off and without cut-off, for sale cheap. Address North Star Iron Works Co., Minneapolis, Minn.

For Sale—The machinery, tools, plating apparatus and raw material of manufacturing establishment; now working on orders in brass and other metals; very low rent, including steam power. Address Manfr., P.O. Box, 285, New Brunswick, N.J.

For Sale—A first-class foundry and machine shop; large connection in saw-mill county in the South, including buildings, lots, machinery, and mills' supply stock on hand; business will be carried on until sold; reason for selling, retiring from business; apply at or address Southern Foundry, AM. MACHINIST.

BRADLEY'S UPRIGHT CUSHIONED HELVE HAMMER

Established 1832.



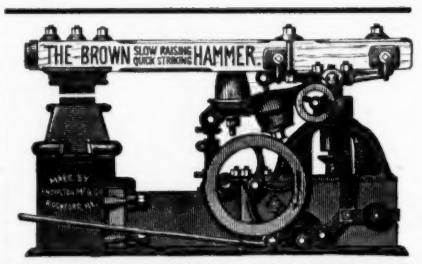
Combines all the best elements essential in a first-class Hammer. Has more good points, does more and better work and costs less for repairs than any other Hammer in the World.

BRADLEY & CO. Syracuse, N.Y.

BEAUDRY'S UPRIGHT CUSHIONED POWER HAMMER

The success of our machine is the best proof of its value. Is more like a steam-hammer than any other, yet has all the economic advantages of a power hammer, and is far superior to any. Will work a larger bar of steel or iron and turn out more difficult forgings than any other hammer made. Guaranteed as represented, or no sale.

BEAUDRY & CUNNINGHAM, Boston, Mass.



THE BROWN HAMMER

STRIKES A BLOW WITH

Double the Velocity That It Raises the Hammer.

A NEW MOVEMENT! SEND FOR DESCRIPTION.

Knowlton Mfg. Co., King St., Rockford, Ill.

STEPHENS PATENT VISES.

50 PER CENT. OF time and labor saved by using this solid, strong, durable, quick-working Vise. Has the Improved Taper, Pipe and other attachments. Sold by the trade. Send for circular.

MELVIN STEPHENS, Prop'r.
Office, 41 Dey Street, New York

—OUR— NEW **Catalogue of Tools**

and Supplies sent free to any address on receipt of Ten Cents in Stamps (for postage).

CHAS. A. STRELINGER & CO., Wood Ave., Detroit, Mich.

SWEET'S — Measuring Machine.

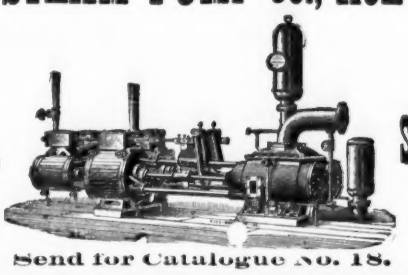
The only micrometer that will not lose its accuracy by wear.

Satisfaction Guaranteed.

SYRACUSE TWIST DRILL CO.
Syracuse, N. Y.

THE DEANE STEAM PUMP CO., HOLYOKE, MASS.

BUILD WATER WORKS, ENGINES AND STEAM PUMPING MACHINERY.



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TORRINGTON, CONN.

SHAPERS, PLANERS, LATHES, DRILLS, and SPECIAL MACHINERY,

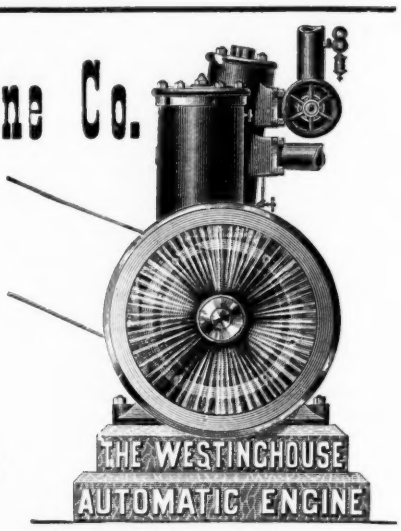
SEND FOR CATALOGUE.

THE **Westinghouse Machine Co.**

MANUFACTURERS OF

THE WESTINGHOUSE AUTOMATIC ENGINE.

PRICES REDUCED.



The Condemnation of Our Competitors is the Measure of Our Success.

SALES DEPARTMENT of the U. S. Conducted by

WESTINGHOUSE, CHURCH, KERR & CO.

17 CORTLANDT ST., NEW YORK. | 98 FOURTH AVE., PITTSBURGH, PA.

FAIRBANKS, MORSE & CO., . . . Chicago, Ill.
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PARK & LACY, . . . San Francisco, Cal.
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D. A. TOMPKINS, & CO., . . . Charlotte N. C.
ROBERT MIDDLETON, . . . Mobile, Ala
H. DUDLEY COLEMAN, . . . New Orleans, La

Ejectors for Raising Water

From PONDS, TANKS, QUARRIES, MINES, EXCAVATIONS, ETC.

Also, as BILGE PUMPS FOR VESSELS

PRICE LIST.

CAPACITY PER HOUR IN GALLONS.	PRICE.	SUCTION AND DISCHARGE PIPE.	STEAM PIPE.
500	$8 00	¾ in.	⅜ in.
800	10 00	1 "	¾ "
1200	15 00	1¼ "	1 "
1700	20 00	1½ "	1¼ "
3000	24 00	2 "	1½ "

A. ALLER, 109 Liberty Street, New York.

S. ASHTON HAND MFG. CO.,

Toughkenamon, Chester Co., Pa.

MAKERS OF FIRST-CLASS

ENGINE LATHES

Are now in position to put on the market

14" ENGINE LATHES OF NEW DESIGN,

guaranteed to be equal in material, design and workmanship to the best ever offered.

PATENT UNIVERSAL SCREW-CUTTING, CENTER, DEPTH, ANGLE AND **TWIST DRILL GAUGE.**

J. WYKE & CO.

Fine Machinists' Tools, E. BOSTON, MASS. Send for Circular.

I. W. COLBURN & Co.
FITCHBURG, MASS.
100 MAIN ST.
LOWEST LIVING PRICES
ARC AND INCANDESCENT LIGHTING AND PLATING MACHINES.

ECONOMICAL STEAM BOILERS

A SPECIALTY.

SEND FOR PRICES. **Pond Engineering Co.** ST. LOUIS, MO.

FOR SALE, AT A BARGAIN.

Fine Water Power on Raquette River. Small Foundry and Machine Shop, with flasks and patterns. Agricultural Region. Saw Mills and Tanneries within easy reach. Shop has made a specialty of water wheels, horse powers, farm machinery and mill repairs. Excellent railroad facilities. Good dwelling and 3 acres of land included. Will be sold at half its value to close an estate. Full particulars on application. Wead & Paddock, Attys., Malone, N. Y.

COOKE & CO., DEALERS IN

Machinery and Supplies,

22 CORTLANDT ST., NEW YORK.

AGENTS FOR

The Waters Perfect Governor.

Having Adjustable Speed, Automatic Safety Stop, Sawyer's Lever, and Solid Composition Valves and Seats. Also,

SUPPLIES

For Machinists, Railways, Mills, Mines, Etc.

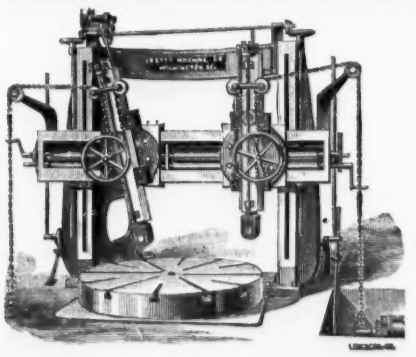
Please send for circular and state that you saw the advertisement in this paper.

GEO. F. BLAKE MANF'G CO.

BUILDERS OF EVERY VARIETY OF

95 & 97 LIBERTY ST., NEW YORK. 44 WASHINGTON ST., BOSTON.

WATER WORKS PUMPING **ENGINES A SPECIALTY**



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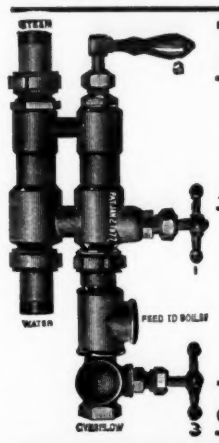

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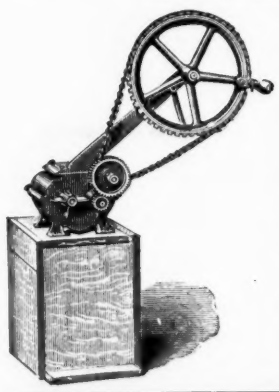

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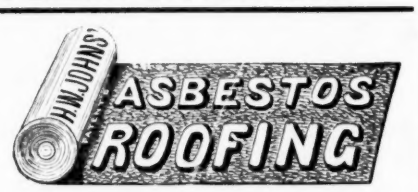

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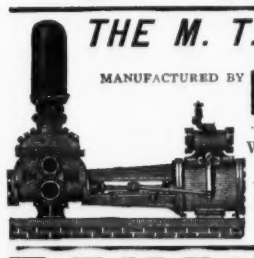

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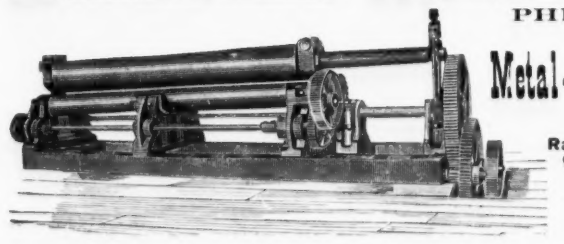

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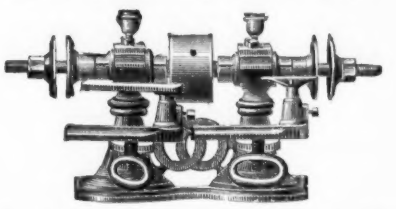

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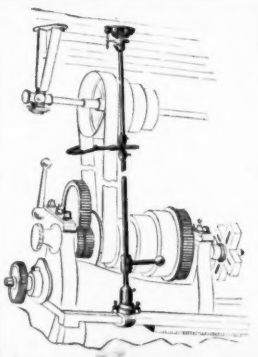

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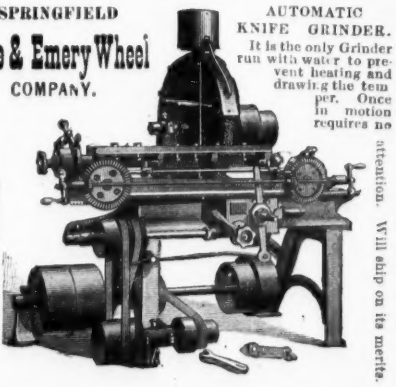

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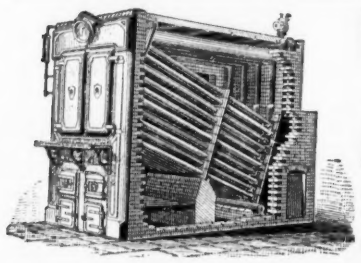

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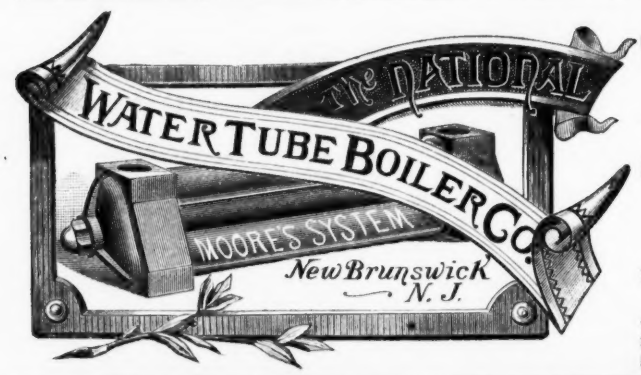

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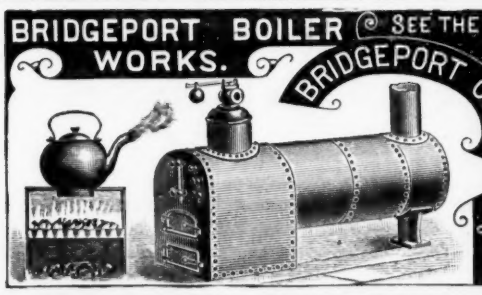

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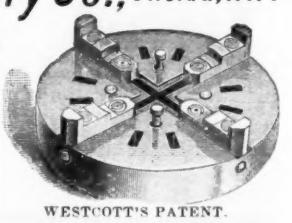

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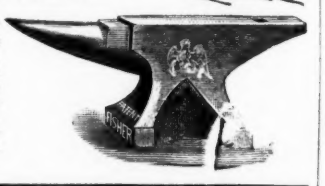

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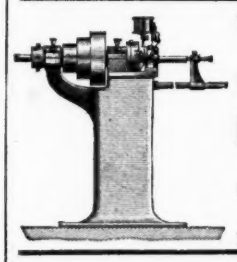

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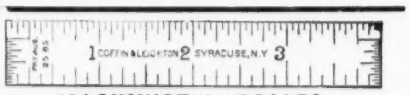

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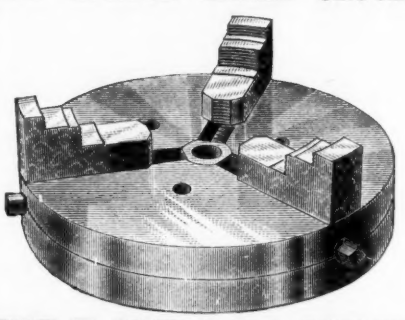

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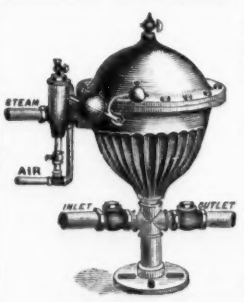

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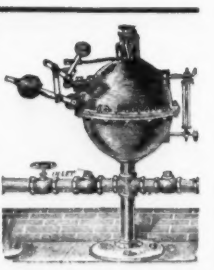

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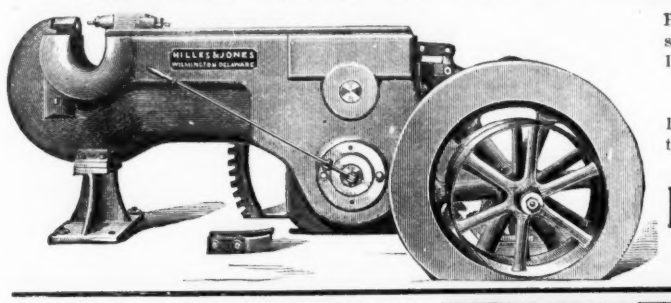

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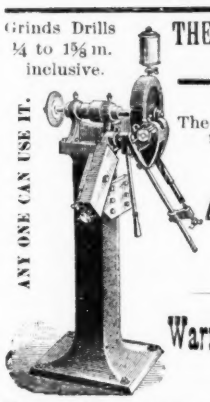

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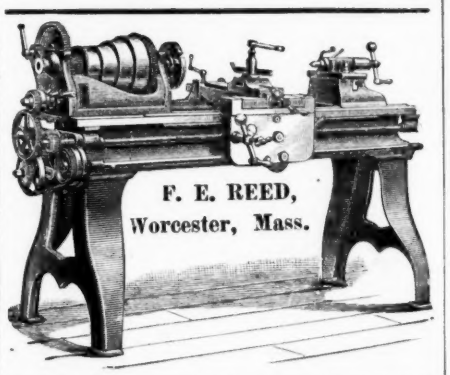

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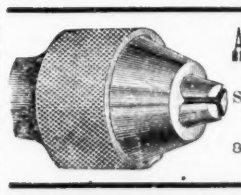

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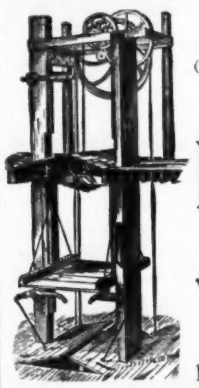

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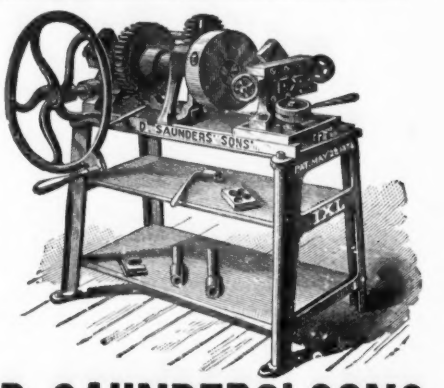

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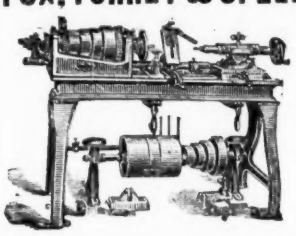

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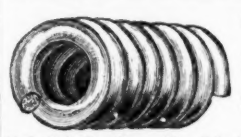

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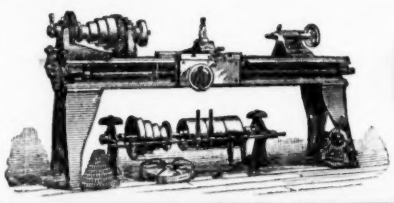

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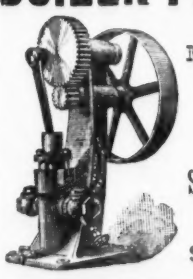

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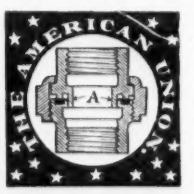

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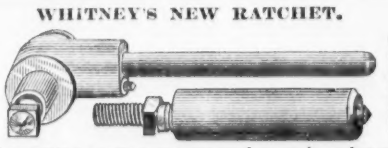
Steel.  Polished.

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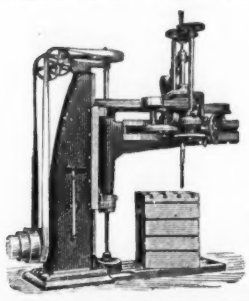

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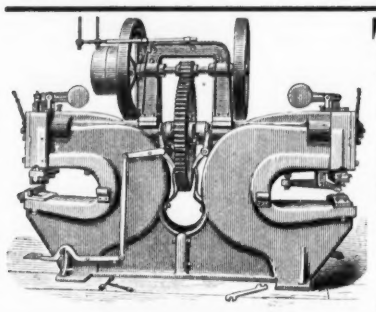

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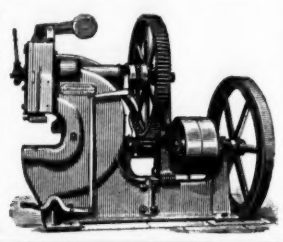

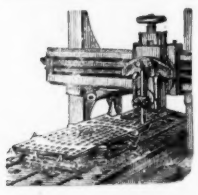

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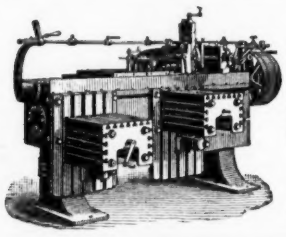

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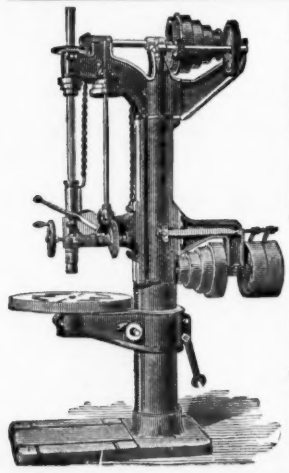

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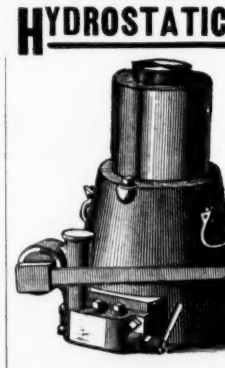

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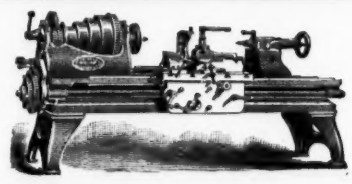

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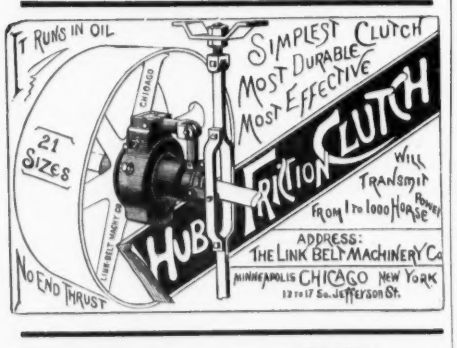

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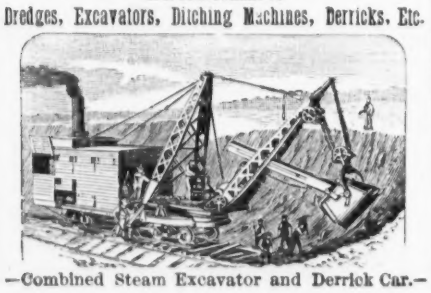

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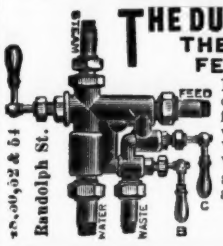

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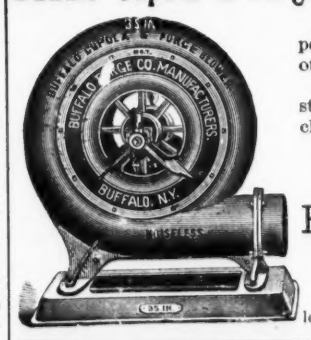

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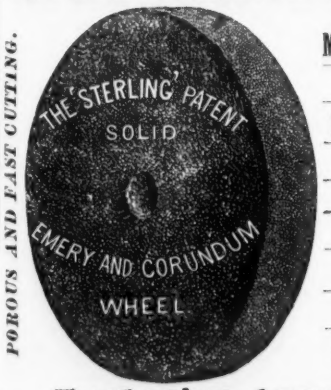

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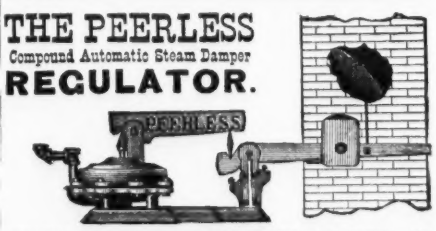

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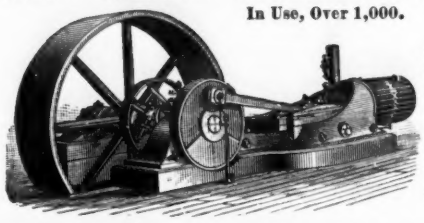

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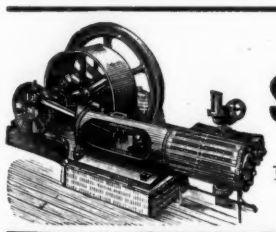

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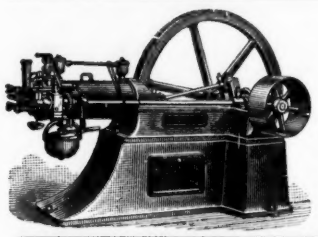

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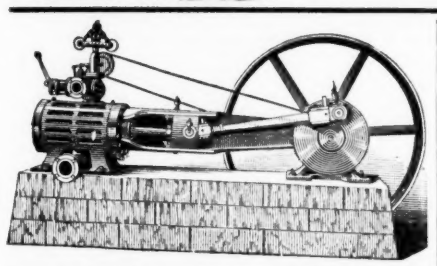

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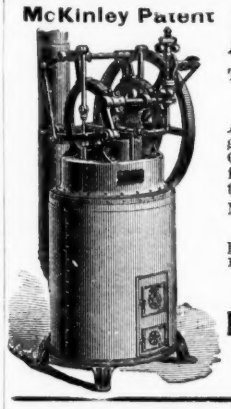

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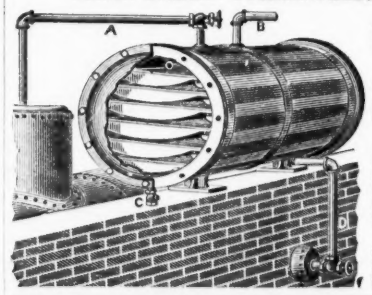

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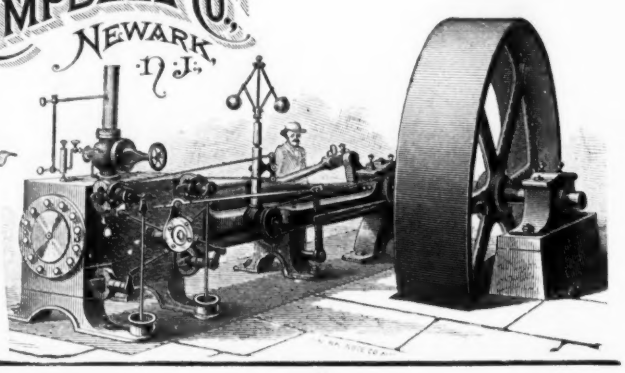

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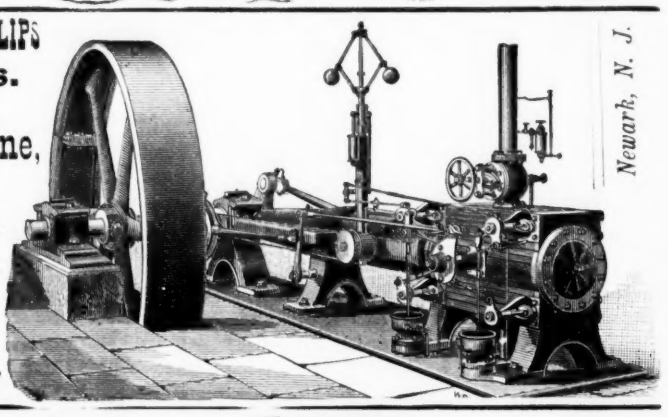

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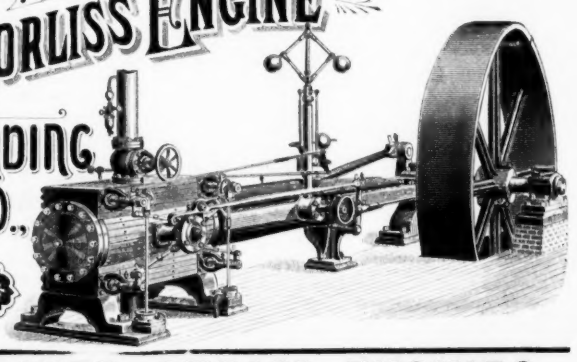

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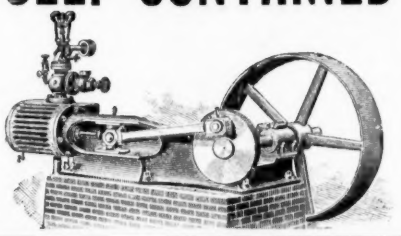

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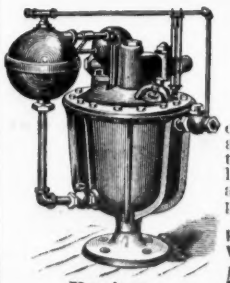

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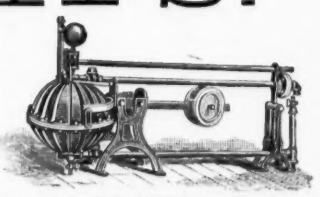

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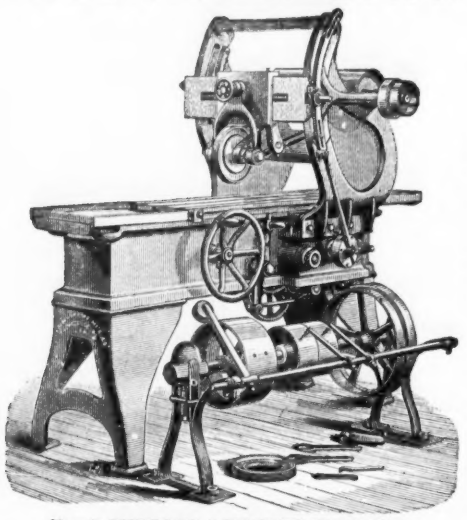

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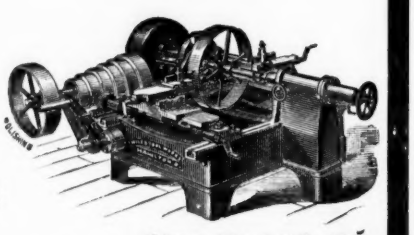

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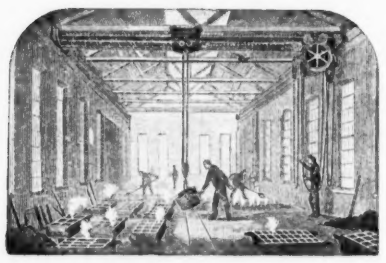

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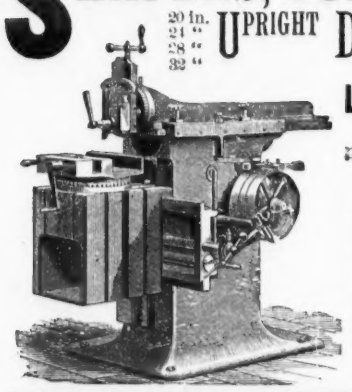

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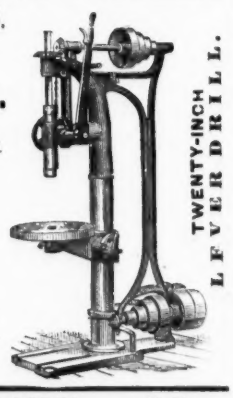

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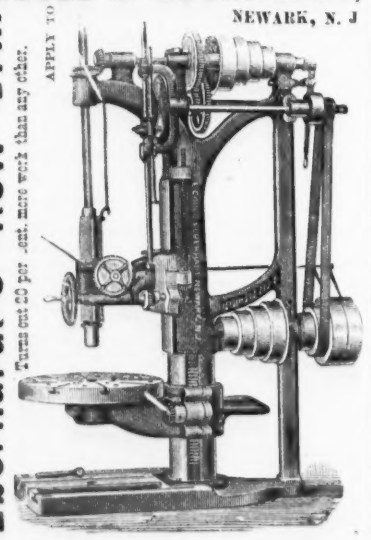

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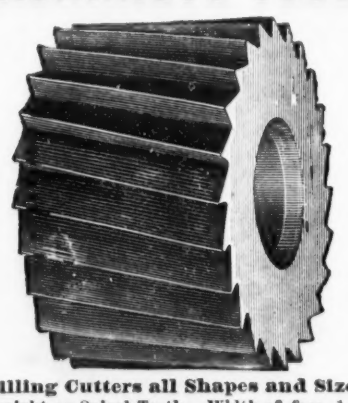

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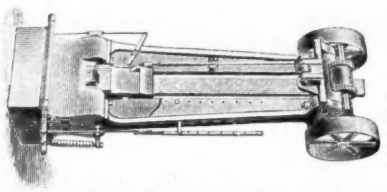

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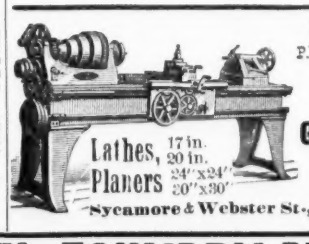

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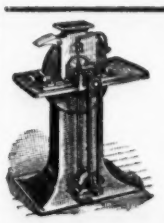

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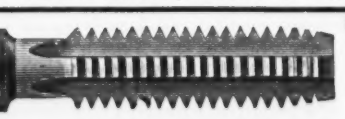

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